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REMINGTON KELLOGG,
Director, United States National Museum.

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Proceedings of the United States National Museum

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A NEW AMERICAN GENUS OF CRYPTOPID CENTIPEDES, WITH AN ANNOTATED KEY TO THE SCOLOPENDROMORPH GENERA FROM AMERICA NORTH OF MEXICO

By Ralph E. Crabill, Jr.

Of all centipedes perhaps the Scolopendromorpha are the best known, at least at generic and suprageneric levels. This knowledge has come about partly as a result of the availability of large numbers of study specimens drawn very widely from the earth, and partly as a result of the relatively clear-cut, usually well-defined assemblages that we encounter throughout much of the order. In contrast, where our understanding of the suprageneric structure of all other centipedes is faulty or imperfect, the lack of adequate numbers of geographically representative specimens or intrinsic categorical difficulties or both are generally responsible.

The scolopendromorphs that we know best, quite understandably, are the larger forms—the kinds attractive to collectors because they are big, fierce looking, and, in the tropics, abundant; for the most part they are the familiar Scolopendridae. By the same token the ones that we know less well are the smaller, often tiny Cryptopidae. Here I believe much more remains to be learned; as a matter of fact, it is quite reasonable to anticipate the discovery particularly in the New World Tropics and Subtropics of new cryptopid species and new cryptopid supraspecific patterns, the present new genus being one example.

The new form seems most like those presently included under *Kethops*, and yet apparently differs sufficiently to warrant elevation to equivalent generic rank. Admittedly this decision may seem undesirable once the suprageneric structure of the Scolopocryptopinae has been extended and more perfectly delineated; however, at the

time of this writing, certain of the differences distinguishing *Thalkethops grallatrix*, new genus, new species, from the *Kethops* species seem at least qualitatively to justify my action.

Thalkethops and *Kethops* stand alone within the scolopocryptopine constellation in their possession of cryptopiform ultimate legs (see note 1, p. 13) and lack of sclerotized plates or other appurtenances on the anterior prosternal margin (fig. 13). The lack of prehensorial spinous processes of the basal article distinguishes both genera from the two closely allied genera, *Scolopocryptops* and *Dinocryptops* (see note 2, p. 13). They also differ from *Kartops* in lacking prosternal armature. *Newportia* and *Tidops* are readily signalized by their seventh pedal segment spiracles, which *Thalkethops* and *Kethops* lack.

I believe the most striking superficial features of *Thalkethops* are also prominent among the features giving it its generic identity, namely, the extraordinarily long antennal articles (fig. 5), and the long, thin, almost stiltlike legs (hence *grallatrix*, a female stilt walker, see fig. 14). Additional characters of significance are the following: *T. grallatrix:* Tarsi 1–21 each with a nearly complete circumarticular suture (fig. 3), hence each essentially bipartite; sternital cross-sulci and submarginal sulci absent. *Kethops* spp.: Tarsi 1–21 each undivided, not suturate (fig. 12); sternital cross-sulci more or less and submarginal sulci always distinct. Finally, the following characters may prove to differ consistently between the two: *T. grallatrix:* Each first maxillary coxosternum with a thin longitudinal and essentially membranous strip (fig. 7); coxopleural ventral margin without a submarginal sulcus, its edge not reflected to form a low flange. *Kethops* spp.: Each first maxillary coxosternum without a thin membranous strip (at least in *T. euterpe* Crabill); coxopleuron with a submarginal sulcus, with a flangelike reflected edge (at least in *T. euterpe* Crabill and *T. utahensis* (Chamberlin), the genotype).

Several features of *T. grallatrix* suggest adaptation for cave life. The long, light, thin legs seem well suited for swift passage along the cluttered cave floor and over the walls and perhaps along the ceiling. The pale, virtually transparent tergites and appendages may represent a loss of pigmentation such as is well known to occur commonly in many kinds of cavernicoles.

Thalkethops, new genus

Generic diagnosis: Color: Tergites, sternites, and parts of legs mostly translucent, the underying musculature plainly discernible underneath. Antennae, each with 17 articles; each article extraordinarily elongate. Cephalic plate without eyespots or margins; posteromedially with a pair of short, slightly divergent sutures. Maxillae: First, each coxosternum with a weak longitudinal membra-

nous strip; second, its apical claw long and acuminate, its dorsal edge pectinate, its ventral edge undissected. Prehensorial segment: Prosternum with anterior margin plain, without sclerotized ridges or plates; ventrally without, dorsally with a short pair of sinuous chitin-lines. Prehensors: Spinous processes and denticles absent; poison calyx in trochanteroprefemur, robust and elongate; tarsungula of normal size and configuration (as in *Kethops*). Tergites: First with omegoid sutural pattern plus posterior paramedian sutures and anterior cervical suture; 2–22 each with complete paramedian sutures; other sutures absent; 23 without sutures or sulci. Sternites: 1–22 each with a shallow midlongitudinal sulcus; submarginal and cross-sulci both apparently absent. Spiracles: Not operculate; on pedal segments 3, 5, 8, 10, 12, 14, 16, 18, 20, and 22. Legs: 1–21 each long and very thin, each tarsus essentially divided by an incomplete ventrobilateral suture, none with a dorsal condyle; 22 very long and thin, tarsus with a dorsal condyle and completely bipartite; 23 the leg cryptopiform, the tarsus with condyle, the prefemur, femur, tibia, and 1st tarsus each with from one to many ventrally ankylosed mucrones (see note 3, p. 13); the pretarsus unlike those preceding, without accessory claws. Coxopleuron: Porigerous; with a ventroposterior short, thin, acute spinous process.

Type species: *Thalkethops grallatrix*, new species (by present designation and monotypy).

Thalkethops grallatrix, new species

Figures 1–5, 7, 9–11, 13–16

Holotype probably female. New Mexico, Eddy County, Carlsbad Cave (see note 4, p. 14); Dixon Freeland and Thomas Ela, August 31, 1957, USNM 2505.

Body length 34.5 mm. General color: Antennae, head, prehensors, and ultimate legs with associated segment pale yellow; tergites, sternites, and other legs yellowish-white to whitish and translucent to transparent, the underlying musculature plainly disclosed.

Antennae: Each 15 mm. long, each with 17 articles; very pale yellow. From dorsal aspect articles 3–17 conspicuously longer than wide (e.g., 4th, length: width = 3.4 mm.: 1.0 mm.; 10th, l: w = 3.0: 0.6; see figs. 5–6). Articles 1–3 each sparsely clothed with longer setae, 4 partly clothed with finer denser setae, 5–17 densely finely setose.

Cephalic plate: Yellowish, shining, 2.0 mm. long, 2.2 mm. at greatest width; very sparsely invested with minute setae. Posterior corners markedly rounded, sides straight as far as anterolateral angles, thereafter converging to form the anterior apex, the apex centrally indented and bisected by a short distinct suture. Paramedian sutures

distinct, beginning on posterior margin then diverging slightly, the somewhat longer of the two 0.33 mm. long. Cephalic plate without lateral margins.

Clypeus: Deep yellow, sparsely clothed with longer setae. Anterior apex weakly developed. Lateral paraclypeal sutures short, anteriorly incomplete, generally vague.

Labrum: Well separated medially from posterior clypeal margin. Median tooth deeply pigmented, robust, evenly pointed, flanked by heavily sclerotized, deeply pigmented rounded inner shoulders of labral sidepieces. True posterior margins of sidepieces membranous, delicately fimbriulate; beneath (i.e., dorsal to) each the darker heavier portions of each sidepiece are visible. Each sidepiece broadly meeting inner end of its coclypeus. Anterolateral corner of each sidepiece with a minute slitlike opening (of a labral gland?); each sidepiece with a field of microscopic sensory points, each resembling a typical sensillum basiconicum. Anteriorly across entire labrum one well-defined complete and several abortive sclerotic wrinkles (rugae).

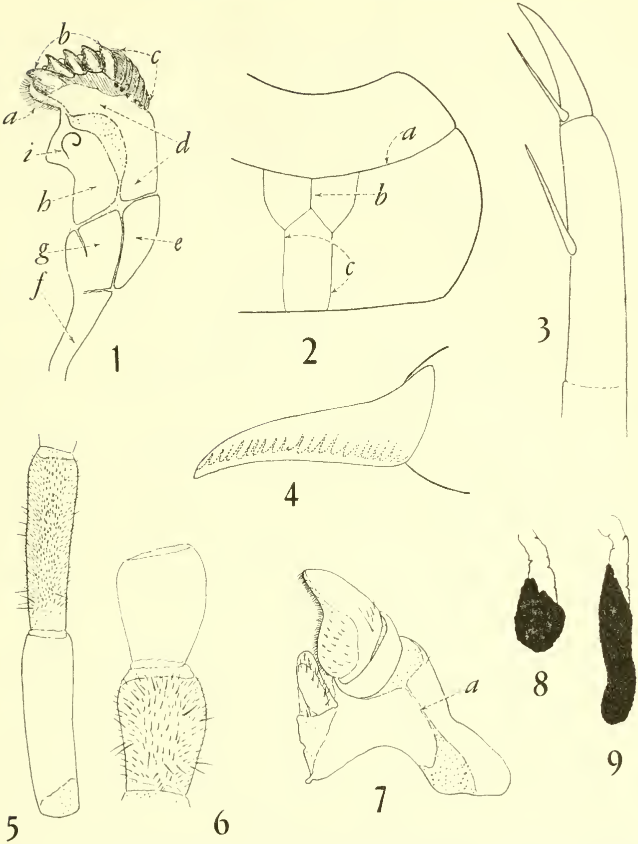
First maxillae: Each coxosternum with a weak longitudinal suture (actually a thin membranous strip).

Second maxillae: Second article with the usual weak dorsodistal spur. Claw long, acuminate, its dorsal edge pectinate, its ventral edge straight, undissected. Dorsal brush dense, beginning at about middle of third article.

Mandible: As shown in figure 1 (see also note 5, p. 14).

Prehensorial segment: Prosternum: Setae sparse, the majority relatively long; surface impressed with numerous microscopic pits each with a sensory point (i.e., each resembling a sensillum basiconicum); ventrally without chitin-lines, dorsally with a pair of short abortive and sinuous chitin-lines (see note 6, p. 14); pleuroprosternal sutures distinct, complete; anterior margin unarmed, without plates or raised sclerotized border, the two sides apparently (but not actually) separated by a midlongitudinal short membranous strip. Prehensors: All articles with numerous sensilla basiconica; none with spinous processes, denticles, or other armature; poison calyx within the trochanteroprefemur, elongate, thick; tarsungula of normal size and configuration (as in *Kethops*, see figs. 8 and 9), evenly curved from base to tip; poison canal aperture dorsal, very long and narrow, its greatest length to width=5:1.

Tergites: First pedal tergite yellowish, with a few larger setae; with a distinct cervical suture to which are attached omegoid (i.e., W-shaped) sutures, their posterior apices continuous with prominent paramedian sutures. Tergites 2–22 whitish and translucent, the posterior border very pale yellowish, the underlying musculature plainly visible, very sparsely clothed with minute setae; each impressed



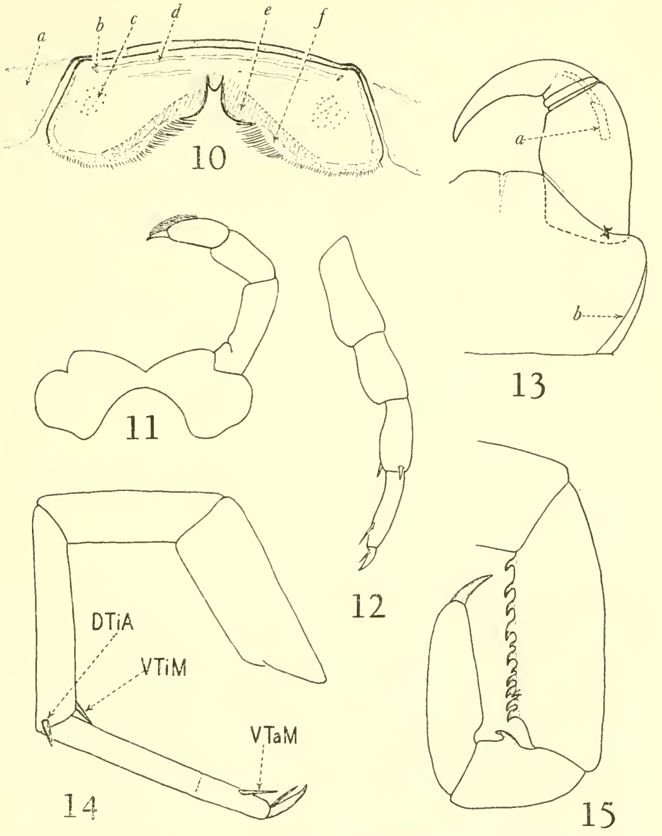
FIGURES 1–9 (unless otherwise stated, the following depict parts of *Thalkethops grallatrix*, holotype).—1, Right mandible, outer surface (see note 5): *a*, pulvillus; *b*, teeth; *c*, sickle bristles; *d*, lamina dentifera; *e*, lamina triangularis; *f*, manubrium; *g*, lamina manubrii; *h*, lamina condylifera; *i*, condylus or condyle. 2, First pedal tergite, dorsal (setae omitted): *a*, cervical suture; *b*, omegoid or W-shaped sutural pattern; *c*, paramedian sutures. 3, Distotarsus and pretarsus of tenth leg (setae omitted). 4, Second maxillary claw, left, ventral aspect. 5, Fourth (lower) and 5th (upper) antennal articles, left, (setae of 5th shown, of 4th omitted). 6, *Kethops euterpe* Crabill, type, 4th (lower) and 5th (upper) antennal articles, right (setae of 4th shown, those of 5th omitted). 7, First maxilla, left, ventral aspect (all setae shown): *a*, weak membranous strip. 8, *Kethops euterpe* Crabill, Right poison calyx (black) with its duct (outlined). 9, Right poison calyx (black) with its duct (outlined).

longitudinally with two distinct paramedian sutures; each with a pair of broad very shallow longitudinal submarginal troughs or sulci ectal to the aforementioned paramedian sutures, the sulci delineating very weakly defined atypical tergital margins on about 3 or 4 through 22.

Sternites 1–22: Each whitish and translucent, the underlying musculature visible; setae extremely sparse and minute. Each longer than wide. Each with a shallow midlongitudinal and rather broad sulcus, these best seen on 1 through 20 or so, thereafter evanescent, barely discernible on 20 and 21; cross-sulci apparently absent; submarginal sulci absent.

Spiracles: Present on pedal segments 3, 5, 8, 10, 12, 14, 16, 18, 20, and 22 (see note 2, p. 13). Legs 1–22 whitish to dilute yellowish-white; setae tiny and sparse except on prefemora and femora, which have a few more robust and deeply colored setae. Legs 1–21 each thin and relatively very long (10th leg not including trochanter and pretarsus, 6.17 mm.; 1st tarsus (1.17 mm.)+2d tarsus (0.57 mm.)> tibia (1.57 mm.)> prefemur (1.53 mm.)>femur (1.33 mm.)); a pale suture incomplete only dorsally indistinctly dividing each tarsus into a longer very slightly thicker proximotarsus and a shorter very slightly thinner distotarsus; dorsal condyles absent on 1–21; each pretarsus with 2 very long thin accessory claws (actually spurs ankylosed to base of pretarsus). Legpair 22: Tarsus completely divided, with a prominent pigmented dorsal condyle; slightly longer than preceding legs, otherwise not differing significantly. Prectrotaxy: VTaM=1–21, VTiM=1–22, DTiA=1–21; pretarsal accessories=1–22.

Ultimate pedal segment and legs: Tergite yellowish, opaque, with about 20 scattered setae; without sutures or sulci; slightly longer than wide, posterior margin evenly bowed outward, the apex round and broad; side abruptly reflected upward on each side to form a flange with the contingent upper coxopleural margin. Coxopleuron yellowish-white, opaque; with a few stout setae; porigerous area without setae reaching anterior margin but separated from dorsal margin by a narrow strip, posteriorly sloping ventrally to posterior and ventral margins, pores small, numbering at least 100 on each side; ventrolateral margin not reflected into a flange, not submarginally sulcate; each coxopleural spinous process very thin, almost ensiform, between ⅓ and ¼ as long as posterior margin is high, tipped with a black point and 2 delicate setae, its shaft ventrally with 2 stout setae; the ventral edges of the 2 coxopleura contiguous for nearly their entire lengths. Ultimate legs: Right (left abnormal), excluding pretarsus, 6.0 mm. long (i.e., prefemur+trochanter=1.80 mm., femur=1.50 mm., tibia=1.27 mm., 1st tarsus=0.60 mm., 2d tarsus=0.83 mm.); yellow and opaque; trochanter nearly completely amalgamated with prefemur, the latter very slightly flattened dorsally, the remaining articles dorsally



FIGURES 10–15 (unless otherwise stated, the following depict parts of *Thalkethops grallatrix*, holotype).—10, Labrum, ventral aspect: *a*, coclypeus; *b*, slitlike opening; *c*, field of sensilla basiconica; *d*, translabral rugae; *e*, solid, pigmented underlying portion; *f*, hyaline, fimbriulate posterior border of labrum. 11, Second maxillae (all setae omitted). 12, *Kethops euterpe* Crabill, 10th leg, anterolateral surface (setae omitted). 13, Prosternum and left prehensor, ventral aspect (setae omitted): *a*, poison calyx; *b*, pleuroprosternal suture. 14, Tenth leg, anterolateral surface, showing serial spurs and their formulae (setae omitted). 15, Ultimate right leg, inner surface (setae omitted), showing pigmented mucrones.

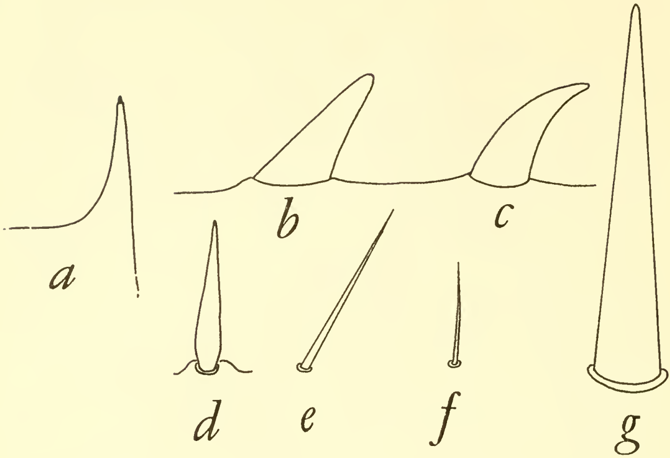


FIGURE 16.—*Thalkethops grallatrix*, holotype: *a*, typical spine, the spinous process arming the coxopleuron of *grallatrix; b*, a straight mucro; *c*, a curved mucro; *d*, a lanceolate setae; *e*, *f* typical setae; *g*, a typical leg spur or calcar.

rounded; all articles finely dorsally setose; prefemur on each side with sparse stout lanceolate (see note 3, p. 13) setae, ventrally with a linear series of 7 short stout and pointed ankylosed mucrones (see note 3, p. 13) and a few scattered fine setae; femur ventrally with 12 ankylosed mucrones, its sides with lanceolate setae; tibia ventrally with a row of 11 mucrones, without lanceolate setae, subdensely with long fine setae; first tarsus ventrally with one hooked firmly ankylosed (nearly spiniform) mucro; second tarsus proximoventrally excavate, without mucrones or lanceolate setae, with numerous long fine setae; pretarsus long, thin and curved, without accessory claws.

Key to the Scolopendromorph Genera of America North of Mexico

The key given below should facilitate the identification of all scolopendromorph genera and obligate higher categories presently known to be represented in America north of Mexico.[1] In addition, I have included and identified by daggers (†) those few genera common to adjacent regions to the south, chiefly Mexico, whose presence within our area may eventually be demonstrated. Following the

[1] Since the preparation of this manuscript Professor Chamberlin has written me of his discovery of a new Californian *Ethmostigmus;* this is the first record of the genus in North America. At the time of this writing his description of the new species was not published.

key, the North American distribution of each genus is briefly summarized, and mention is made of the more important species. To the best of my knowledge, a similar treatment devoted to the genera represented in North America has not appeared in print since 1893, a span of years characterized by the steady accumulation of distributional information as well as by significant revisionary activity.

1*a*. With four ocelli on each side of the cephalic plate . . SCOLOPENDRIDAE (2)
1*b*. Without ocelli, the ocellar positions either concolorous with the remainder of the cephalic plate or unpigmented and contrasting with the deeply colored environs . . . . CRYPTOPIDAE (3)
2*a*. Spiracles operculate, i.e., each divided into an inner and an outer atrium by an internal and essentially tripartite valve . . . SCOLOPENDRINAE (5)
2*b*. Spiracles not operculate, i.e., each spiracular atrium fully exposed, none with an internal valvular partition . . . . OTOSTIGMINAE (7)
3*a*. With 21 pairs of legs and pedal segments 4
3*b*. With 23 pairs of legs and pedal segments . . . . SCOLOPOCRYPTOPINAE (8)
4*a*. Anterior margin of prosternum with a pair of elongate, coarsely toothed plates. Cephalic plate with prominent eyespots in the ocellar positions. Ultimate pedal segment conspicuously elongate; ultimate legs extremely heavy, robust . . . . THEATOPINAE, genus **Theatops**
4*b*. Anterior margin of prosternum without such toothed plates. Cephalic plate without eyespots. Ultimate pedal segment of normal proportions. Ultimate legs only slightly heavier than penults . . . CRYPTOPINAE (12)
5*a*. First or proximotarsi of the first 15 to 20 pairs of legs each with a prominent ventrodistal spur 6
5*b*. No proximotarsus with a ventrodistal spur. . . . Genus **Hemiscolopendra**
6*a*. Ultimate pretarsus basally with two accessory claws . . Genus **Scolopendra**
6*b*. Ultimate pretarsus without accessory claws . . . . Genus **Arthrorhabdus**
7*a*. Seventh pedal segment without a pair of spiracles . Genus **Otostigmus** †
7*b*. Seventh pedal segment with a pair of spiracles. Trochanteroprefemur of prehensor with a prominent inner spinous process. . . . . Genus **Rhysida**
7*c*. Seventh pedal segment with a pair of spiracles. Trochanteroprefemur of prehensor without an inner spinous process . . . Genus **Ethomostigmus** †
8*a*. Seventh pedal segment with a pair of spiracles (see note 2, p. 13). Ultimate second tarsus either subdivided into many pseudosegments or undivided 9
8*b*. Seventh pedal segment normally without a pair of spiracles. Ultimate second tarsus undivided. 10
9*a*. First pedal tergite often with an omegoid sutural pattern, always with posterior paramedian sutures, complete or abortive. Ultimate second tarsus divided into pseudosegments . . . . Genus **Newportia** †
9*b*. First pedal tergite never with an omegoid sutural pattern, normally without paramedian sutures or fragments thereof. Ultimate second Tarsus undivided . . . . Genus **Dinocryptops** (formerly *Scolopocryptops*; see note 2, p. 13)
10*a*. Prosternal anterior margin with a pair of low dark, heavily sclerotized ridges. Trochanteroprefemur distally with a prominent inner spinous process. Genus **Scolopocryptops** (formerly *Otocryptops*; see note 2, p. 13)
10*b*. Prosternal anterior margin unadorned, without dark, well sclerotized ridges. Trochanteroprefemur without an inner distal spinous process 11

11*a*. Legs 1–21 each without trace of tarsal division. Sternital cross-sulci usually apparent; submarginal sulci typically pronounced.
Genus **Kethops**

11*b*. Legs 1–21 each with a tarsal suture delineating a proximotarsus and a distotarsus. Sternital cross-sulci absent; submarginal sulci absent.
Thalkethops, new genus

12*a*. Each coxopleuron with a prominent ventroposterior spinous process.
Genus **Anethops**

12*b*. Each coxopleuron without such a process, its posterior border essentially straight . . . . Genus **Cryptops**

Distribution of Genera

Scolopendridae

Scolopendra: There are apparently fewer than half a dozen species in North America; of them three are quite common, viz, *viridis* Say, in the Southeastern Atlantic, South-Central, and apparently in some Western States; *polymorpha* Wood, in the States west of Missouri; *heros* Girard, throughout most of the Southern States across the continent. In addition, a number of Tropical or Pantropical species are frequently intercepted at seaports; e.g., *alternans* Leach, *subspinipes* Leach, and *morsitans* Linné; none is known to be established within North America. In general, distribution of the genus in North America is different east and west of about long. 95° W., as follows: East of long. 95° W., from the gulf coast north into southern Missouri, Illinois, and Kentucky (*heros* and *viridis*), up the Atlantic Coastal States from Florida as far north as southern Virginia (*viridis*); west of long. 95° W., throughout the Southwest (*heros*, *polymorpha*, and perhaps *viridis*), up the Pacific Coastal States as far north as Washington (*polymorpha* and *heros* extending evidently only into California and Utah), throughout all but the most northern Montane and Plains States (*polymorpha* and possibly *heros*). Both *heros* and *polymorpha* have been reported from Mexico, but whether the true *viridis* occurs there, in my opinion, remains to be settled.

Arthrorhabdus: One species, *pygmaeus* (Pocock), has been recorded infrequently from New Mexico, Texas, and Arizona. It undoubtedly also inhabits adjacent Mexico.

Hemiscolopendra: Only *punctiventris* (Newport) [=*Cormocephalus* (*H.*) *punctiventris* (Newport) of authors] is believed to inhabit North America. Quite common east of the 95th meridian, viz, from just south of the Great Lakes to the gulf coast and Southeastern Atlantic States where it is extremely prevalent, on the Atlantic coastal plain northward into Virginia, Pennsylvania, New York, and New England; not known to occur west of about long. 95° W., in the United States.

Otostigmus: This genus is common to all Tropical and most

Subtropical lands including America south of the United States. Its species can be expected at seaports, and probably one or more Mexican forms presently undetected have established themselves in our extreme Southwest.

Rhysida: A common Neotropical genus, *Rhysida* is represented in the United States by at least one possibly established species, *longipes* (Newport), discovered recently in southern Florida (Chamberlin, 1958, p. 14). Others may eventually be found in the Southwest. The report of *celeris* (Humboldt and Saussure) in Georgia given by Kraepelin (1902, p. 150) and repeated by Attems (1930, p. 189) has not been corroborated by subsequent collections. My own suspicion is that the species is not established in inland Georgia at the present time.

Cryptopidae

Theatops: Four species are known to occur in North America: *T. californiensis* Chamberlin (?=*erythrocephala* (Koch)), California and Oregon; *phana* Chamberlin, Texas; *spinicauda* (Wood), Mexico and California in the West, in the East from northern Missouri and Illinois south to the Gulf States, north through the Carolinas, continuing up the coastal plain probably as far as extreme southern Pennsylvania; and *postica* (Say), recorded sporadically from Utah and Arizona, in the East a very common and widespread centipede, viz, southern Illinois to Ohio, south to the Gulf States, and north to northern Virginia. In general, the western distribution of the genus is poorly known, but east of the Plains States *postica* and *spinicauda* have been reported from numerous localities, viz, very common in the Southeastern Atlantic States, both extending northward to south of the Great Lakes and well up the Atlantic coastal plain; not known to occur in New York and New England.

Newportia: Abundantly represented in the American Tropics, this genus is as yet unrecorded from the United States; however, its presence in the Southwest near Mexico is a possibility.

Dinocryptops (formerly *Scolopocryptops*, see Crabill, 1953, p. 96): *D. miersii* (Newport), a common Neotropical species, has been linked several times with areas in the United States, principally California and the Southeastern Atlantic States (Attems, 1930, p. 256, and Kraepelin, 1902, p. 78). Chamberlin (1911, p. 475), probably following Kraepelin, reported: "Doubtfully recorded from California. However it is widespread in the Southeastern States and through Mexico." Despite these reports I have yet to see a single North American specimen, so that everything considered, I am inclined to doubt the presence of established populations in the Southeastern Atlantic States. At the same time it seems not unreasonable to anticipate finding, say, *miersii* in the Southwest near Mexico.

Scolopocryptops (formerly *Otocryptops*, see Crabill, 1953, p. 96): Represented by at least five species, it is the most widespread scolopendromorph genus of North America; east of the Mississippi its members are among the most commonly-encountered centipedes. Indeed, in the East from Massachusetts to the Gulf of Mexico, one can hardly overturn many logs and rocks without discovering specimens of the large orange or red-orange *sexspinosa*. Again, we do not know much about the genus in the Far West; viz, *gracilis* Wood is common in California but has also been reported from Texas, while a presumed subspecies, *g. peregrinator* (Crabill) (1952, p. 124), is common in montane Virginia and has been taken in Maryland and Pennsylvania; *munda* Chamberlin, is known only from Kendrick, Idaho (possibly an intraspecific variant of *gracilis*); *sexspinosa* (Say) is the commonest eastern species, but west of the Rocky Mountains it is known from Alaska, Vancouver Island, all of the Pacific Coastal States and from Mexico. East of the Rocky Mountains recorded distributions are more complete: *S. sexspinosa* (Say), the dominant form, is known to range from the North Central States south to the Gulf of Mexico and east to the Atlantic coast, thence north to Massachusetts; *rubiginosa* L. Koch is common in the midcontinent, from Kansas and Missouri east to Ohio, north through Minnesota and Wisconsin, and undoubtedly inhabits adjacent Canada as well; *nigridia* McNeill is apparently entirely eastern, its known range extending from and including Alabama north into Indiana, east of the Appalachians where it is extremely common northward into eastern Pennsylvania.

Kethops: Recorded from Utah, New Mexico, Arizona, and adjacent Mexico. The geography of the genus is known almost entirely from the type localities of its four species.

Thalkethops, new genus: Known only from Carlsbad Caverns in southeastern New Mexico.

Anethops: Only the rare Californian *occidentalis* Chamberlin has been described.

Cryptops: A number of foreign species have been detected within North America; one of them, the European *hortensis* Leach, is definitely known to be established in the Northeast and in Utah. It is undoubtedly more widespread than we now know. Of our half dozen or so species, *hyalina* Say occurs widely, at least east of the Plains States. It appears to be common throughout the Midwestern, Southeastern Atlantic, and Northeastern Atlantic United States, its known range stopping just short of New England (in whose temperate coastal areas it and *hortensis* undoubtedly occur). There is some evidence that *hyalina* may be either polytypic or reducible to several species. In general one may postulate *Cryptops* to occur throughout all but the extreme northern United States.

Supplementary Notes

1. Unfortunately, the ultimate legs of the British Guianan *Kartops* have never been described. "Cryptopiform," a new term, is used here to describe the recurrent type of ultimate leg seen in the genus *Cryptops* and characterized by the possession of an opposable second tarsus capable of being flexed against the first tarsus and lower tibia to form a clasping apparatus.

2. For a clarification of the correct allocation of *Scolopocryptops* (formerly *Otocryptops*) and *Dinocryptops* (formerly *Scolopocryptops*), the reader is referred to Crabill, 1953, p. 96. Careful examination discloses that members of the two genera are very similar save in one striking particular, the presence in *Dinocryptops* and the absence in *Scolopocryptops* of seventh pedal segment spiracles. Nonetheless, I believe them to be more closely related to each other than either of them is to any other scolopocryptopine genus now known. The loss of spiracles among the scolopendromorph genera is like the loss of primary tarsal division among certain genera and species, or like the variation in the Lithobiomorpha in tergital production. All are changes that may proceed independently within quite different evolving lines. So it is that we encounter all states of tarsal change both within the Scolopendromorpha and Lithobiomorpha. For the same reason we find both spiracular conditions (seventh segment spiracles present or absent) in both great divisions of the Scolopendromorpha. As is well known, considerable variability in this character is also seen in the lithobiomorphous Henicopidae. I believe, therefore, that these changes are taking place repeatedly in parallel fashion independently within different phyletic lines. I am less certain of their direction, though the evidence suggests that the trend is toward spiracular loss, tarsal consolidation (the bipartite tarsus becoming undivided), and in the Lithobiomorpha toward the secondary loss of tergital corners—these changes appearing concomitantly with progressive body contraction and consolidation.

3. To insure our understanding one another, I feel that it is most desirable to establish a uniform terminology for the setae, spines, spurs, and other armature of the centipede leg and body sclerite. For instance, the word spine as it is currently used in the literature often refers to a variety of structures among which it is obviously desirable to distinguish. Equally if not more confusing is the ruck of German terms that one must depend upon in the great monographs—Sporne, Höcker, Spinen, Zapfen, Borsten, Sägezähne, and Dornen—all of which when unqualified or when used differently upon different occasions lead to much misunderstanding and confusion. The terminology that I have adopted and used consistently for some years is based upon the definitions of Professor Comstock (1940, p. 32) and

of the eminent insect morphologist Dr. R. E. Snodgrass (1935, ch. 3), and may be summarized as follows: A spur or calcar is a movable multicellular outgrowth connected by a joint to the exoskeleton. A seta is a movable unicellular outgrowth connected to the exoskeleton by a joint. In contrast a spine is an immovable multicellular outgrowth of the exoskeleton but not connected to it by a joint (i.e., not arising from a socket or alveolus). In figure 16*a*, we see a typical spine—the coxopleural spinous process of *T. grallatrix*—multicellular and immovably attached to the exoskeleton. In figure 16, *d–g* are all movably attached and are fundamentally setiform structures; *d–g* are setae of various sorts, *e* and *f* being typical setae and *d* being a modified seta here for the sake of convenience termed a lanceolate seta; *b* and *c* though immovably attached to the exoskeleton and though apparently spinous are in reality spurs or setal derivatives as is shown by their vestigial alveoli. Thus, *b* and *c* are secondarily ankylosed setae, to which for convenience and clarity I have applied the new term "mucro" (pl. "mucrones"); *g* is a spur or calcar such as is typical of distal pedal positions.

4. Carlsbad Caverns, the subject of an interesting book on its fauna by Vernon Bailey in 1928, are situated in the desert of the Pecos River Valley of southeastern New Mexico and is maintained by the National Park Service. I should like to take this opportunity to express my gratitude to Chief Ranger Tom Ela and Ranger Dixon Freeland, the collectors, and to Dr. Thomas C. Barr of Tennessee Polytechnic Institute, who transmitted the specimen to me for examination.

5. The mandibular differences distinguishing the geophilomorph families or family-groups have been well known and used for over half a century, but the application of mandibular criteria in other orders, particularly in Scolopendromorpha, has been generally slighted except perhaps by the late Karl W. Verhoeff, the first person to study the mandible with any precision and from the standpoint of comparative morphology (see Verhoeff, 1918, pp. 467–532). Verhoeff extended study beyond the examination of the masticatory surface and thereby prepared the way for future investigations, which I believe may reveal the scolopendromorph mandible to possess adjuvant higher categorical characters heretofore unsuspected. Verhoeff's designation in German of previously unnamed and obscure mandibular parts has perhaps compromised the adoption or even the study of his work. Obscure parts without ready interlinguistic cognates should, I feel, be expressed in an international idiom, preferably in classical terms or at least in approximate classical derivatives. While terms like head, Zähne, back, foot, bouche, yeux, etc., are readily understood and translatable by anyone, the correct, consistent application of, e.g.,

Polster, Dreieck, and Zapfenstück, are not. The following new terms are intended to replace their original German counterparts, which are given in parentheses, the new terms being for the most part closely synonymous; since teeth and sickle bristles are self-explanatory in whatever language they are rendered, they are given below in English and German: a=pulvillus (Polster); b=teeth (Beisszähne); c=sickle bristles (Sickelborsten); d=lamina dentifera (Zahnstück); e=lamina triangularis (Dreieck); f=manubrium (Schaft); g=lamina manubrii (Schaftplatte); h=lamina condylifera (Zapfenstück); i=condylus or condyle (Drehzapfen).

6. Heretofore by "chitin-lines" authors have referred to ventral thin pigmented sutures or ridges, one passing anteriorly toward the condyle on each side of the prosternum, but here I refer to a new character dependent upon their dorsal homologues. The suture ectal to each chitin-line is usually called the coxopleural suture, a confusing designation since the coxopleuron is at the rear of the body. To avoid ambiguity and confusion, I propose a surrogate expression—pleuroprosternal suture.

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A FOURTH CONTRIBUTION TO THE KNOWLEDGE OF NEOTROPICAL PLATYRHACID MILLIPEDS (DIPLOPODA: POLYDESMIDA)

By Richard L. Hoffman [1]

Introduction

Because of the striking appearance and the great size of many species, millipeds of the family Platyrhacidae have long attracted the attention of diplopodologists. Unfortunately, although 43 generic and about 250 specific names have been proposed in the family, published information on the group has so far been largely of a miscellaneous descriptive nature. Only Carl Attems has attempted to present an account of all the known species (1938), but despite its reference value, his treatment is at best a compilation and in no sense qualifies as a careful systematic study.

A large quantity of material is now available in various collections, but unfortunately these collections are scattered widely in Europe and North America. A thorough revision of the family remains to be undertaken by someone having the opportunity for extensive and leisurely travel. In the meantime, it is possible to clear up a number of isolated matters relating to nomenclature and systematics. I feel that the publication of three earlier papers (1953a–b, 1956)—all

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admittedly preliminary studies—serves a useful purpose in contributing to the taxonomic stability of the family, and now sufficient material has accumulated to justify yet another.

Most of the material upon which the following discussion is based is from the collection of the U.S. National Museum (USNM), made available to me through the kindness of Ralph E. Crabill and J.F. Gates Clarke. James A. G. Rehn kindly permitted me to study the holotype of *Platyrhacus atratus* at the Academy of Natural Sciences of Philadelphia (ANSP). My friend R. W. Lichtwardt of the Botany Department, University of Kansas, is due my heartiest thanks for his gift of the type specimen of the new *Nyssodesmus* herein described.

The existence of validated but unidentifiable names in the literature is a matter of much concern to systematists, and it is always gratifying to be able to dispose of such enigmas. Inasmuch as both genera and species of diplopods are based largely on male genitalia, and since this fact was not fully appreciated by most early workers, present-day students of the group find themselves with more than their share of distressing and often insoluble taxonomic problems. For example, 14 generic names have been proposed for American platyrhacids, including the typical genus of the family. The type species of only three of these genera were illustrated by their authors, and even these drawings were far from satisfactory. The resulting confusion can be imagined, particularly since most species of Diplopoda are still known only from the type specimens. Some workers dealing with platyrhacids made a bold effort to interpret the subtle (or meaningless) original diagnoses; some selected names arbitrarily; others gave up in despair and lumped all of the Neotropical species into one big catch-all genus; and at least one disdained the ancient tangle and merely proposed new generic names whenever the occasion seemed to require.

The difficulties that we have here are great; however, some progress is slowly being made. The following list includes the American generic names that have to be considered, with an indication of their current status:

Platyrhacus Koch (1847): Valid
Cyphorrhacus Cook (1896b): Unknown
Psammodesmus Cook (1896b): Valid
Barydesmus Cook (1896b): =*Platyrhacus*
Nyssodesmus Cook (1896b): Valid
Rhyphodesmus Cook (1896b): Valid
Nanorrhacus Cook (1896b): Valid
Tirodesmus Cook (1896b): ?Valid
Spilodesmus Cook (1896b): Unknown
Arcydesmus Cook (1896b): Unknown

Proaspis Loomis (1941): Uncertain
Aymaresmus Chamberlin (1941): Valid
Dynesmus Chamberlin (1941): ?=*Tirodesmus*
Ernostyx Chamberlin (1941): =*Psammodesmus*

Of the foregoing names, some have been stabilized recently by the examination of their type species or closely related ones. A few, such as *Nanorrhacus*, have been based upon fairly well described species. In the three earlier papers (1953a–b, 1956), I suggested an identification for *Platyrhacus* that seems to be well founded and established the synonymy of *Ernostyx* with the older *Psammodesmus*. It is now possible to consider three additional genera from the list, and, equally important, to dwell briefly upon the hitherto untouched subject of generic classification within the family.

Gonopod Morphology and Suprageneric Groupings

Since systematic groupings in the Diplopoda are based to such a large extent upon the structure of the gonopods, it would seem obligatory that these appendages be studied and illustrated in detail for each new species. Actually, however, some workers have proposed dozens of new forms without any illustrations whatever, or have provided only the most schematic and unsatisfactory drawings. Only within recent years have a few investigators become concerned with careful study of gonopod structure and the establishment of serial homologies throughout various generic groupings.

Although the American platyrhacids, so far as is known, are structurally rather similar in comparison to their more diverse counterparts in the Indo-Australian fauna, it is possible to detect morphological conditions in the form of the gonopods that undoubtedly reflect evolutionary divergencies on a suprageneric level. Of the genera treated in this paper, *Platyrhacus* and *Nyssodesmus* appear to be closely related and may be considered as belonging to a group in which the seminal groove proceeds along the coxal side of the telopodite, whereas the solenomerite originates from the adcoxal surface, the latter being reflected somewhat proximad by a slight torsion of the tibiotarsal region. The groove is thus directed transversely across the face of the telopodite in order to gain entry to the base of the solenomerite.

The gonopod in *Psammodesmus* departs radically from this arrangement in that the solenomerite is derived instead from the coxal face of the telopodite and thus in direct line with the normal course of the seminal groove (contrast the gonopods in figs. 1, *a* and *e*).

In the forms known to me there is nothing to suggest which of these two conditions may be the more specialized. It is possible that two primitive terminal processes became independently adapted to carry the seminal groove, and that the distal torsion of the telopodite in

Platyrhacus is a mechanical adaptation to bring the smaller and more delicate solenomerite into a position adjacent to the sternum of segment 6 where the solenomerite is shielded, in situ, by the larger and broader tibiotarsal element. In *Psammodesmus*, where the solenomerite is already on the inner edge of the telopodite, there is less necessity for such modification.

Divison of the Platyrhacidae into subfamilies has been essayed but once, in the very brief conspectus of Oriental forms by O. F. Cook (1896a). His subfamilies were based largely upon characters of body form and ornamentation, and were never recognized by later workers. Although a classification of the entire family on the basis of gonopod structure remains to be accomplished, it does not seem premature to recognize the affinities of various genera, when relationships are evident, by the proposal of tribal names, some of which may subsequently be elevated to the rank of subfamilies. A start in this direction is made with the two groupings of genera proposed in this paper.

Platyrhacini, new tribe

Composed of platyrhacid genera in which the gonopods are simple in form, the prefemur and femur forming a straight or nearly straight trunk at right angles to the coxite and without special processes; tibiotarsus represented by a thin laminate process directed or bent in the direction of the coxal axis, usually more or less twisted or bent slightly mesiad and shielding a small short solenomerite that originates from the edge of the telopodite away from the coxa. Seminal groove proceeding distad from its origin along the coxal side of the telopodite, thence crossing its mesial face to gain entry to the solenomerite.

This tribe includes four American genera, separable by the characters stipulated in the following key:

1. Tibiotarsus of gonopod directed distad in line with the median axis of the femur . . . . **Tirodesmus** Cook
   Tibiotarsus of gonopod distinctly turned cephalomesiad at an angle of 30 to 90 degrees from the median axis of the femur, in the direction of the coxa . . 2
2. Lateral margins of paranota set off as distinct smooth rims, not produced into dentations; hypoproct rounded in outline . . **Aymaresmus** Chamberlin
   Lateral margins of paranota not set off, the upper surface continuous to the edge, which is usually provided with marginal dentations or large tubercules; hypoproct subtrapezoidal in outline 3
3. Distal third of telopodite bent toward the coxa at an angle of about 90 degrees . . . . **Nyssodesmus** Cook
   Distal third of telepodite bent coxad at a much smaller angle, normally less than 45 degrees . . . . **Platyrhacus** Koch

In addition to the gonopod character cited, *Tirodesmus* differs from the other genera by a peculiar formation of the paranota that may be only specific in value, yet has not been observed in any of the other

known species. The angulation of the telopodite contrasted in couplet 3 is much more pronounced than might be suggested by the illustrations.

Genus *Platyrhacus* Koch

Platyrhacus Koch, 1847, p. 58.—Hoffman, 1953a, p. 300; 1953b, p. 252; 1956, p. 46.
Barydesmus Cook, 1896b, p. 53 (orthotype: *Barydesmus kerri* Cook). New synonymy.

Barydesmus was very briefly diagnosed in the body of a synoptic key to American platyrhacoid genera, and the type species was not illustrated. The generic name therefore fell into disrepute and has remained a nomen inquirendum down to the present time. Fortunately, the original type specimen of *Barydesmus kerri* is located in the U.S. National Museum collection, and has been available for restudy. I am of the opinion that this type specimen belongs to the large genus of South American species that seems to include the type species of *Platyrhacus;* however, it is still not possible to state definitely that *B. kerri* is absolutely congeneric with *P. scaber* Koch.

Platyrhacus kerri (Cook), new combination

FIGURE 1*a*, *b*

Barydesmus kerri Cook, 1896b, p. 53.

Holotype, male, USNM 2380, Ecuador (further details of locality and collector not indicated).

REMARKS: I do not at this time venture a specific diagnosis for *P. kerri* since the characters of most of the known platyrhacids are as good as unknown. The type specimen is in good condition though discolored and perhaps somewhat telescoped from strong alcohol. It is about 89 mm. in length and 19 mm. in greatest width. The antennae are 11.6 mm. long. The second segment is wider than the collum and slightly wider than the third segment. The collum is nearly smooth, without anterior marginal tubercules or a postmarginal transverse groove. The tergites are smooth or at most finely coriaceous, with fine low tubercules evident upon drying. Lateral margins of paranota dentate with three to five subacute projections. On the caudalmost segments, the caudolateral apex of the paranota is drawn out into a short, acute, incurved point.

The gonopods, in situ, cross each other at about the midlength of the telopodite. The coxites are rather elongate, with three long macrosetae on the dorsal side, and with other vestiture lacking. From the mesial aspect, the telopodite is very slightly arcuate, curving somewhat cephalomesiad over the coxa. The solenomerite is short, slender, and a little sinuate; the tibiotarsus has a flattened lamina and is drawn out into an acute tip, with only the narrow dimension visible mesially.

The discovery of the long-misplaced type specimen of *P. kerri* creates some doubt about the validity of Silvestri's *Barydesmus tenebrosus*, also described as from Ecuador. The doubt cannot be settled, of course, until the type of the latter form is restudied, but the similarities of the two are striking.

Attems (1938, p. 234) placed *Platyrhacus fraternus* Carl in the synonymy of *tenebrosus*, but I believe without much justification, Carl's species was from Costa Rica and was well described; Attems. subsequent account was apparently based on specimens from the same country. But the original description of *tenebrosus* is not sufficiently detailed to form the basis of such a combination, particularly since species in *Platyrhacus* are often separable by a combination of small characters rather than by any one conspicuous feature. The geographical difference involved here also militates against the likelihood of specific identity.

Platyrhacus acanthopleurus, new species

FIGURE 1*c*

Holotype, male, USNM 2535, Cauca Valley, Colombia, 3,000 ft. (date and collector not indicated).

DIAGNOSIS: A small species of *Platyrhacus*, dorsally bilineate, the lower pleural areas with numerous stout, acute tubercules in a compact field above the posterior leg pair; gonopods typical of the genus, the tibiotarsus drawn out into a fine point, without a terminal secondary dentation.

DESCRIPTION: Length, 62 mm.; greatest width, 12.0 mm. at the 12th metatergite.

Color pattern largely faded, most of dorsal surface now a dirty yellowish white; paranota brown, beset with numerous white tubercules; caudal edge of most tergites with a broad, transverse, dark brown band; middorsum with a light brown, median band extending from collum to epiproct, somewhat wider on prozonites (1.8 mm.) than on metazonites (1.5 mm.). Head, antennae, legs, and underparts yellowish gray except for brown caudal edges of the pleurites.

Head capsule strongly granulate except for the depressed and polished clypeal area. Interantennal ridges low and inconspicuous; subantennal ridges not developed. Subantennal swellings large, transverse, ovoid, tuberculate. Lower halves of genae depressed or flat, the lateral edges sinuate. Labral setae 8–8; clypeal 3–3, the outermost on each side remote from the other two; a pair of widely spaced frontal setae and a pair each of closer-set subantennal and vertigial setae; no interantennal setae or their sockets detected. Width of head across genae, 6.0 mm.

Antennae closely spaced (isthmus 1.5 mm. wide), rather long (9.0 mm.) and robust, reaching back to middle of third paranotum; articles clothed with long sparse setae; articles 2–5 subequal in size and shape; 6 longer, without evident distal sensory areas; 7 small, subconical, its distal margin inturned and separating the four sensory cones.

Collum rather small (7.1 mm. wide, 4.0 mm. long) and modified as follows: Anterior third of surface and most of the short, acutely triangular paranota nearly flat and smooth, without anterior marginal row of tubercules and postmarginal transverse furrow; posterior

Figure 1.—*a, b, Platyrhacus kerri* (Cook): *a*, Mesial aspect of left gonopod of male holotype; *b*, outline of left paranotum of 18th tergite; *c*, *Platyrhacus acanthopleurus*, new species, mesial aspect of left gonopod of male holotype; *d*, *Nyssodesmus attemsi*, new species, mesial aspect of left gonopod of male holotype; *e*, *Psammodesmus atratus* (Chamberlin), mesial aspect of left gonopod of male holotype.

two-thirds (except for an oval median depression) strongly elevated to a high caudal margin that overhangs the following prozonite, the surface of the margin coriaceous-tuberculate, lacking transverse series of larger tubercules.

Following segments generally similar in shape and sculpture; the paranota of segments 2 and 3 swept forward and much wider (10.0–10.5 mm.) than collum, laterally each produced into two sharp spicules. Metazonites of segments 2–4 strongly produced above level of adjacent prozonites and provided with a posterior submarginal series of 14–16 small, flat, nearly contiguous, polished tubercules. Middorsum of these and following tergites nearly smooth; dorsum of paranota densely set with small ovoid tubercules. Anterior margin of paranota smooth and polished, terminating laterally in a sharp projecting spine; caudal margin with a row of small tubercules. Poriferous paranota with three or four lateral spines; the others normally with only three. Peritremata set at midlength of paranota, about one diameter from the lateral margin.

Caudad, the elevation of metatergites is less pronounced; the transverse row of tubercules less conspicuous; the tubercules widely spaced and usually 12 in number. Likewise the caudalmost two, lateral, paranotal teeth become closer together and carried increasingly caudad as the corners of the paranota is produced, finally creating the impression of a stout, slightly incurved, apically bifid spur. Middorsum of segment 19 nearly flat, finely granular. Epiproct robust, depressed, its margin forming a semicircle, with six marginal setiferous tubercules; upper surface coriaceous, with a median subterminal depression.

Anal valves nearly flat, each with an ovoid depression in the upper center and a distinct quadrate basal lobe overlapping on the produced lateral tips of the hypoproct. Mesial edges of valves not set off as raised margins, but differ in texture from the remainder of the valves in being smooth and polished instead of finely granular. Submarginal setiferous tubercules evenly spaced at one-third and two-thirds the length of the margin, the upper pair on the polished rim, the lower set slightly back onto the granular surface.

Hypoproct large, robust, subtrapezoidal; the distal edge somewhat trisinuate with a slightly developed median lobe between the convexities of the paramedian tubercules; basal margin swollen, strongly produced ventrad, overlapping and concealing midventral section of anal segment and in contact with that of segment 19. Laterally the hypoproct is produced into small triangular lappets providing fulcra for the basal lobes of the anal valves.

Prozonites and metazonites of most segments separated by a well-defined interzonal furrow, equally distinct around body but slightly

wider on the sides; prozonites uniformly finely granular; pleural areas of metazonites more coarsely granular and beset with numerous rounded to conical tubercules, those immediately above the legs hypertrophied into a field of large, prominent, acute denticles, spines, and bidentate cones, some exceeding caudal margin of segment. Stigmata large, swollen, followed on most segments by a similar appearing protuberance adjacent to the base of the posterior leg pair.

Sternal areas of metazonites produced into a high, abrupt platform (podosternum) accommodating the coxal sockets, with low, obtusely conical, caudolaterally directed knobs at the base of each leg; podosterna with median cruciform depressions entirely glabrous.

Legs long (up to 8.5 mm.), distal half of femora visible beyond paranota in dorsal aspect, the joints cylindrical, setose, in decreasing order of length 3–6–2–4–5–1. Tarsal claws long, slightly arcuate, slender, almost half as long as tarsi and fully as long as prefemora.

Sterna produced into small acute cones at the bases of legs 4–7, the sternum of segment 6 depressed and widened to accommodate tips of the gonopods.

Seminal lobes of second coxae hemispherical with a small distal median papilla.

Sternal aperture of segment 7 ovoid, with lateral and caudal raised rims, anteriorly transgressing only slightly into the prozonite. Gonopods rather small, slender, directed cephalad and parallel to each other. Coxites and telopodites of the form typical for the genus, apparently a little different in the form of the prefemur on the coxal side where it is broadened and produced into a slight knob. Femur long and slender, virtually parallel sided in mesial aspect, grading into a thin laminate tibiotarsus that is drawn out into an acute tip, the terminal third turned over somewhat mesiad. Solenomerite directed distad parallel to the tibiotarsus, gradually attenuated, very slightly sinuate.

Remarks: This species is described and named as new with some diffidence because of nearly a dozen inadequately documented specific names based on platyrhacids from the northern Andes in Columbia and Ecuador. As long as these names remain inquirendae, it certainly seems best to treat species from that region as new and give full descriptions, rather than cause a series of misidentifications by endeavoring to assign specimens to any of the doubtful existing names.

One known species rather closely approximates *Platyrhacus acanthopleurus*. This is one from Sao Paulo do Olivencia, on the Amazon River in western Brazil, which was identified by Attems (1938, p. 234) as *Polydesmus bilineatus* Lucas (1840). However, the creature originally described by Lucas was said to have come from "Mexico," and its description does not inspire much confidence in future recogni-

tion of the species. Although the chances that Attems' material is conspecific with the type specimen of *Polydesmus bilineatus* seem very slight, I refrain from suggesting a new name until the Brazilian species is restudied and compared with the considerable number of new species recently described by Chamberlin (1941) from the adjacent Department of Loreto, Peru.

According to Attems' description, the pleural spines of his species form a row along the caudal margin of the segments all the way from sterna to level of insertion of the paranota, in contrast to the strictly basal cluster in *Platyrhacus acanthopleurus*. There appear also to be differences in the shape of the gonopod prefemur, the position of the ozopores, and the development of transverse tuberculation. Probably a closer study of Attems' material will provide numerous other minor differences. I do not doubt that the two are closely related, but the great difference in localities alone virtually precludes their identity. I have been unable to reconcile *acanthopleurus* with any of the Peruvian species described by Chamberlin in 1941.

Genus *Nyssodesmus* Cook

Nyssodesmus Cook, 1896b, p. 53.—Hoffman, 1953b, p. 253.

Type species: *Nyssodesmus alboalatus* Cook, by original designation.

Range: Central America, from western Panama to Nicaragua.

Nyssodesmus was proposed as a new genus on the basis of a specimen from Nicaragua in which the male gonopods are "nearly straight for about two-thirds of their length, and are then bent toward the animal at nearly a right angle." In his summary of the millipeds of Central America Chamberlin (1922) described several additional species conforming to this general configuration, but also used the name *Nyssodesmus* to include species that are now considered to belong to *Platyrhacus*. Although Attems (1938) rejected *Nyssodesmus* as a nomen nudum, he substituted in its place the equally vague name *Tirodesmus*, which had been proposed in Cook's 1896b paper. Attems' concept of *Tirodesmus* embraced members of what I consider four valid genera as well as *Tirodesmus* in its strict sense (for *fimbriatus* Peters). The first subsequent proposal to resurrect *Nyssodesmus* as a valid genus as originally conceived by Cook was made in one of my earlier papers on *Platyrhacus* (1953b), in which I allocated the following names to the genus:

N. alboalatus Cook (1896b)
N. tristani Pocock (1909)
N. antius Chamberlin (1914)
N. mimus Chamberlin (1922)
N. bivirgatus Carl (1902)
N. limonensis Attems (1900)

This list unfortunately omitted two species, *N. nicaraguanus* and *N. nigricaudus*, both described by Chamberlin in 1922. Of the total of eight species now accounted for, a key to seven was published by Attems in 1938, omitting only the inadequately known *alboalatus*.

My friend and colleague R. W. Lichtwardt recently sent for identification a platyrhacid from Panama that he had examined for eccrinid fungi. This specimen represents an unnamed form of *Nyssodesmus*, probably a distinct species, which I dedicate to the memory of the distinguished myriapod specialist, Carl Graf Attems.

Nyssodesmus attemsi, new species

Figure 1*d*

Holotype, male, USNM 2468, Puerto Armulles, Panama, collected on August 5, 1952, by G. W. Martin.

Diagnosis: A species of *Nyssodesmus* with obliterated dorsal tuberculation, and with the apex of the gonopod tibiotarsus squarely truncated instead of drawn out or rounded.

Description: Length, about 80 mm., greatest width, 13.5 mm.

Head capsule strongly sculptured; vertigial groove deep and distinct, interantennal ridges high and polished, terminating abruptly just above the first antennal article; subantennal ridges tuberculate to subcristate, subantennal swellings distinctly granular; lower half of genae vertically striate. Labral setae about 9–9, clypeal setae 3–3, the outermost on each side remote from the other two; a pair each of frontal, interantennal, and vertigial setae. Antennae rather long and slender, reaching back to third segment; articles 2–5 subequal in size, clavate, cylindrical; 6 longer and less clavate; 2 not exceeding apex of genae.

Collum broadly subhexagonal, the anterior and posterior margins subparallel across body, abruptly converging laterad to an acute angle; surface of collum roughly granular with an elevated ridge across the front edge and a slightly depressed area on each side of the middle toward the lateral ends. Caudal margin with four or five indistinct low tubercules; anterior margin without traces of tuberculation.

Tergites of segments 2–4 subsimilar in shape, much broader than collum, their paranota directed cephalad, with an anterior marginal ridge and with three or four low indistinct lateral marginal tubercules. Surface of paranota roughly granular, surface of middorsum coriaceous. The following segments with broader paranota that are more nearly transverse; in going caudally the anterior margins are increasingly swept back, the lateral teeth increase to five or six, and the caudolateral angle increases to form a distinct produced and incurved spine on segments 15–17. Simultaneously, the dorsal sculpture diminishes

until the entire dorsum is merely coriaceous to smooth. Peritremata moderate in size, set near the center of the paranota, about five times the diameter from the lateral margin and four times the diameter from the caudal margin. Paranota of segment 19 large, oblong lobes, slightly divergent, extending back to middle of epiproct. Latter large and robust, nearly parallel sided, with the caudal margin slightly convex, the dorsal tubercules pronounced.

Anal valves nearly flat and granular, with two setiferous tubercules on each, the uppermost of which is in contact with the mesial marginal ridge of the valve. Preanal scale (hypoproct) large and inflated, strongly overhanging ventral margin of anal segment, distally produced into two high, conical paramedian tubercules.

Ventral sides of paranota and pleural areas finely granulate, smooth. Podosternites strongly elevated and produced conically near the base of each leg. Basal leg joints nearly glabrous, the distal-most rather densely setose; the joints in decreasing order of length 3–6–2–5–4–1; tarsal claw rather small, straight, polished. Legs 4–7 with a rather high and acute conical sternal process at the base of each; the coxae with a small field of large bristles adjacent to each of these knobs.

Coxae of gonopods rather large, the surface smooth but for three short macrosetae on the dorsal side and a small field of a dozen or so short bristles on the mesial face. Telepodite basally short and straight, slightly constricted just proximad of the midlength, thereafter broadening again; the distal third bent over the coxite forming a right angle with the rest of the telopodite; solenomerite moderately long and sinuate; apex of tibiotarsus drawn out somewhat but distinctly truncate and itself bent at nearly a right angle.

Remarks: On the basis of gonopod structure, *Nyssodesmus attemsi* seems most closely related to *N. tristani* and *N. antius*, and in fact the three forms may eventually prove to be only geographic races of a single species. It differs from these two congeners, as well as from the others, in having the dorsal tuberculation best developed anteriorly, the caudalmost segments becoming virtually smooth. The type specimen, unfortunately, is completely discolored from the preservative, so that we have no idea what the color pattern in life might be.

This is the first species of *Nyssodesmus* to be recorded from Panama, most of the other species occurring in Costa Rica. Presumably the genus is a fairly recent segregate from the original *Platyrhacus* stock that crossed the Panamanian Isthmus and that is still represented in Costa Rica and Panama by several species.

Psammodesmini, new tribe

The genus upon which this group is founded differs from other Neotropical platyrhacids in the relationship of the terminal gonopod elements. The tibiotarsal blade is thin and laminate, but is directed either continuously distad in line with the femur or is bent in the direction away from the coxa. The solenomerite is derived from the coxal side of the telopodite and in direct line with the course of the seminal groove, but is bent adcoxally parallel to the direction taken by the tibiotarsus.

The tribe includes only the single genus *Psammodesmus* Cook.

Genus *Psammodesmus* Cook

Psammodesmus Cook, 1896b, p. 53.—Hoffman, 1953a, p. 301.

Type: *Psammodesmus cos* Cook, by original designation.

Range: Cordilleran Region of northwestern South America, from northeastern Peru to the Isthmus of Panama.

This generic name was revived in one of my recent papers (1953a), which endeavored to account for all of the known species apparently referable to it. However, the valid claims were overlooked of *Platyrrhacus atratus* Chamberlin, which was described in 1947 from specimens taken in southwestern Colombia. The locality alone should have drawn attention to the form as a possible representative of *Psammodesmus.* Although the formation of the gonopod telopodite reflects differences of at least tribal value between the genera *Platyrhacus* and *Psammodesmus,* the structure cannot be clearly observed unless the gonopod is examined from the mesial aspect. *Psammodesmus atratus,* as illustrated in the original description, could not therefore be referred to either of these genera. To correct this shortcoming, a drawing (fig. 1*e*) made from the holotype is provided herewith for comparison with those given in one of my earlier papers (1953a).

Psammodesmus atratus (Chamberlin), new combination

FIGURE 1*e*

Platyrrhacus atratus Chamberlin, 1947, p. 34, fig. 12 (type data given as holotype, male, ANSP 9958, 300 miles up the Atrato River, Colombia).

This species is the largest now known in *Psammodesmus;* it has a maximum width of about 13 mm., whereas the other forms range from 7 to 11 mm. wide. In most other characters, however, it agrees well with them. The ozopores are removed from the lateral margin by a distance of about four times the diameter of a peritreme; none of the paranota are indented or incised adjacent to the pore as in

P. moyobambus (Chamberlin). To be particularly noticed in the figure is the pronounced indentation of the inner margin of the telopodite, just above the coxal articulation. A similar peculiarity is likewise to be seen in *P. schmitti* and *P. moyobambus*, and may prove to be a constant generic character.

Although Chamberlin described the type as being uniformly brown dorsally, I was able to discern traces of two light paramedian dorsal stripes. In my key to species (1953a, p. 304), *P. atratus* runs out readily to *P. fasciolatus* (Silvestri), which, as implied by its name, has a similar color pattern. *P. atratus* differs from its congener chiefly in the shape of the tibiotarsus of the gonopod and its somewhat larger size. Judged from the similarities of the two, and from the geographic proximity of their type localities, the relationship will probably be found to be a subspecific one.

It should be noted in passing that the original binomial combination *Platyrrhacus atratus* as used by Chamberlin is preoccupied in the Diplopoda. Attems (1900) transferred the species named by Pocock (1897) as *Polydesmorhachis atratus* into the genus *Platyrrhacus*, the resulting combination existing in the literature for more than a decade. Those who suppress junior secondary homonyms may wish to rename Chamberlin's Colombian species, but my personal preference is to disregard instances of transient combinations resulting from the arbitrary and often ill-advised shifting of names from one genus to another.

Psammodesmus schmitti Loomis and Hoffman

Psammodesmus schmitti Loomis and Hoffman, *in* Hoffman, 1953a, p. 301, figs. 1–4 (type data given as holotype male, USNM 2016, Port Obaldia, Panama).

This species was described from specimens taken at Port Obaldia on the Atlantic Coast, and Cana in the interior of Darién, both localities being very close to the Panama-Colombia boundary. An additional specimen is at hand from a third locality, the upper Pequene River just east of the Canal Zone, collected on March 25, 1907, by A. H. Jennings (USNM). This specimen extends the range of the species over 100 miles westward along the Isthmus.

The gonopods of the specimen match those of the types very closely. Although considerably bleached by the alcohol, the specimen retains enough pigmentation to indicate that the color pattern consisted of a pair of oblique light paramedian stripes on each tergite, each stripe being directed caudolaterad and probably creating the impression in life of a strongly serrated longitudinal light stripe down each side of the dorsum, on the base of the paranota.

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MILLIPEDS FROM DOMINICA, BRITISH WEST INDIES

By Richard L. Hoffman[1]

While a member of the Smithsonian-Bredin 1956 Caribbean Expedition, Dr. J. F. Gates Clarke of the Division of Insects, U.S. National Museum, collected arthropods on the faunistically little-known island of Dominica, in the West Indies. Although primarily concerned with insects, Dr. Clarke nonetheless obtained a sizeable collection of millipeds, which he kindly transmitted to me for identification and study.

Because of this island's geographic location at the midlength of the Lesser Antilles, its mountainous terrain with several rather high peaks, and especially its unspoiled condition (it is considered to be the island least disturbed by man of all the West Indies), one would suspect that the diplopod fauna of Dominica might contain species of considerable interest and utility in working out the problem of zoogeography in the Antillean region. That this belief is true is more implied than proven by collections made to date. The collections are notable in showing the presence of several endemic species, one of which has no relatives elsewhere in the islands, and in indicating the absence or extreme scarcity of several genera that are common and widespread in the Caribbean area. Obviously, more collecting is needed to confirm these preliminary impressions, particularly in the more remote mountains of the island and with special attention devoted to the search for the small humus-dwelling forms that normally escape the general collector.

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A study of Dr. Clarke's material, however, suggests that a brief survey of the millipeds that he obtained is quite desirable, particularly with respect to the known endemic species, most of which are very poorly described and illustrated, and whose systematic status has often been troublesome to workers treating particular groups of the Diplopoda.

A summary of the pertinent literature is not difficult to devise, as only Pocock (1888, 1894) and Loomis (1934) have contributed original information on the Dominican milliped fauna.

Pocock's first paper dealt with a small collection made on the island in 1886 by G. A. Ramage, and included the descriptions of two endemic species, which he named *Spirostreptus dominicanus* and *Strongylosoma semirugosum.* In his 1894 monograph, Pocock added another new species, *Rhinocricus leucostigma*, to the Dominican fauna.

H. F. Loomis, an experienced student of the group, spent some time collecting on Dominica in early 1933, obtaining additional specimens of *R. leucostigma* as well as many other forms that had not been taken by Ramage The species that he found, chiefly in the vicinity of Roseau, are: *Siphonotus purpureus* Pocock, *Rhinocricus leucostigma* Pocock, *Trigoniulus lumbricinus* (Gerstaecker), *Spirostrophus naresi* (Pocock), *Orthomorpha coarctata* (Saussure), and *Hexadesmus lateridens* Loomis.

Dr. Clarke's material includes all three of the species named by Pocock, two of the five added by Loomis, and two others previously not collected on the island The number of milliped species known from Dominica now stands at ten, of which six, however, are forms widely distributed by commerce and agriculture It is anticipated that collecting in the more remote interior mountains will at least double the presently known total.

Order Glomeridesmida

Family Glomeridesmidae

Glomeridesmus species

A single female belonging to this genus was taken by Dr. Clarke at Castle Bruce Junction, March 10, 1956, with the notation "under leaves and dead wood." Although this species is the first Dominican record for the genus, with the species almost certainly an undescribed one, a new name is not proposed at this time in the absence of males. Females of nearly all known glomeridesmids are quite similar, and cannot be distinguished on the basis of existing accounts in the literature. Several other forms of *Glomeridesmus* have been recorded from the Lesser Antilles: *marmoreus* Pocock from St. Vincent, and *grenadanus* Chamberlin from Grenada and Trinidad. Species are likewise

known from Puerto Rico, Hispaniola, Jamaica, and the South American mainland.

Order Polyzoniida

Family Polyzoniidae

Siphonotus purpureus Pocock

Siphonotus purpureus Pocock, 1894, p. 479.—Loomis, 1934, p. 9.
Siphonotus miamiensis Causey, 1953, p. 71.

A dozen specimens were taken at Antrim at 1,000 ft. on March 10, 1956. All are females, suggesting a very unequal sex ratio for the species.

This species has been reported from most of the islands of the Lesser Antilles, including Dominica, and presumably is a synanthropic form to some extent. It has also been collected in southern Florida, and specimens from Miami were recently described as a new species on the basis of having two transverse rows of setae on the tergites in contrast to their complete absence as attributed to *purpureus*. Pocock's original description contains no information on this character, and if he subsequently published on it, the reference has escaped me. H. F. Loomis found two rows of setae in all his material, which came from six of the Antillean islands and from French Guiana, indicating a very wide distribution for this character. The description of *S. miamiensis* contains nothing to indicate that Loomis's paper had been consulted.

It is possible that a restudy of all available material might show on the basis of male gonopods that several species have been confused under the name *purpureus*, but for the present it seems best to assume a single form, widespread by commerce.

Order Cambalida

Family Epinannolenidae

Genus *Epinannolene* Brolemann

Epinannolene Brolemann, 1903, p. 135.

On the basis of existing knowledge, we have every reason to think that this genus may be of the greatest utility in studying faunal distribution, at least of diplopods, in the Caribbean region. Species of *Epinannolene* occur very abundantly in the northern Andean region of Peru, Ecuador, Colombia, and Panama; others have been recorded from Cuba, Hispaniola, Puerto Rico, Dominica, Grenada, and Trinidad. The apparent absence of species from Jamaica is remarkable. So far none of the species has been studied carefully enough to give any idea about phylogeny and evolution; consequently, we are ignorant of what might be primitive and what might be specialized

characters, and are thus unable to deduce anything about lines of descent and affinity. Nonetheless, each island has its own native species not shared with any other, and so far none of these species can be identified with any species known from South America. If introduction has occurred by natural or artificial means, subsequent speciation has covered up the trail.

So far only one species of *Epinannolene* has been taken on Dominica. The species was first discovered by G. A. Ramage and described by Pocock, in 1888, but was not seen again until Dr. Clarke obtained a nice series of specimens from several localities.

Epinannolene dominicana (Pocock)

Figure 1

Spirostreptus (Nodopyge) dominicanus Pocock, 1888, p. 478.
Epinannolene dominicana Chamberlin, 1918, p. 179.

Males and females of this endemic species were obtained at Castle Bruce Junction on March 20 and 24, 1956, and at the Fresh Water

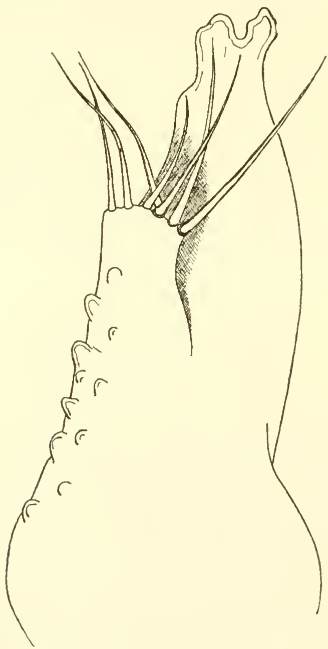

Figure 1.—*Epinannolene dominicana* (Pocock). Caudal aspect of telopodite of left gonopod.

Lake on March 26, 1956. A field note with one lot indicates the specimens were taken from decaying bromeliads.

The original description of this form was not explicit with respect to the gonopod structure, so that it seems desirable to provide an illustration for future comparison with other Antillean species.

That *E. dominicana* is not an introduced synanthropic form seems indicated by the fact that Dr. Clarke's material came from inland high-elevation localities, whereas the species was not taken around Roseau by such an experienced collector as H. F. Loomis.

Order Spirobolida

Family Trigoniulidae

Spirostrophus naresi Pocock

Spirobolus naresi Pocock, 1893, p. 252.
Spirostrophus naresi Loomis and Hoffman, 1948, p. 51 (this paper contains a fairly complete synonymy for the species).

Two large collections of this widespread commerce species were made at Antrim at 1,000 ft. on March 10, 1956, and at West Cubrits at 500 ft. on March 28, 1956. Notes made at the latter locality state: "Soil, leaf mold, and dry leaves on dry lightly wooded hillside."

Ramage did not obtain *naresi* on Dominica, but Loomis found it to be abundant around Roseau in 1932. He also secured specimens of the related *Trigoniulus lumbricinus*, another synanthropic species, which, however, is not quite as widespread in the Antilles as *naresi*, and seems to be more restricted to areas disturbed by the activities of man.

Family Spirobollelidae

Pseudospirobolellus bulbiferus (Attems)

Spirobolus bulbiferus Attems, 1903, p. 71.
Pseudospirobolellus bulbiferus Carl, 1912, p. 93.
Azygobolus tumidus Loomis, 1934, p. 27.
Pseudospirobolellus tumidus Loomis, 1950, p. 165.

Two females of this genus, tentatively referred to the type species, were obtained at Antrim on March 11, 1956. The vial carried the label "night beating," which suggests that the specimens may have been swept from low vegetation while they were making a nocturnal ascent. Numerous other species of spiroboloids are known to climb at night.

Our previous knowledge of this animal in the Western Hemisphere is due entirely to the work of H. F. Loomis, who took the first recorded specimens on St. Martins and Guadeloupe in 1932, and who subsequently found the species on the southern peninsula of Haiti. It is

widespread in the East Indies, and has certainly been introduced into the Antilles by shipping.

Family Rhinocricidae

Rhinocricus leucostigma Pocock

Rhinocricus leucostigma Pocock, 1894, p. 500; Loomis, 1934, p. 16.

Six males and females were taken from Antrim at 1,000 ft. on March 10, 1956. Although the material at hand is badly faded from preservation, I suspect that actually two species are now masquerading under the name *leucostigma*. There is considerable variation in size of adults, and the smaller specimens are not so definitely marked as the larger. Typically the species is black with a middorsal white spot on each segment and one such spot on each side surrounding the ozopore. The small male examined has gonopods of a slightly different form, but whether this condition reflects more than an individual variation cannot be determined at this time. The situation needs further attention, particularly with respect to living colors and the examination of numerous male specimens of both forms.

Loomis found specimens ranging in length from less than 30 mm. to 45 mm. in the vicinity of Roseau. The species is endemic to Dominica, but it has a very similar counterpart in *R. martiniquensis* Chamberlin of the nearby island of Martinique.

Order Polydesmida

Family Strongylosomidae

Genus *Mestosoma* Silvestri

Mestosoma Silvestri, 1897, p. 3.—Kraus, 1956, p. 412.
Habrodesmus Attems, 1937, p. 174.

A considerable number of generic names were proposed for South American strongylosomids by Silvestri near the end of the last century, most of them unfortunately poorly characterized and based upon equally unrecognizable species. Attems reduced the number to two in his 1937 monograph, recognizing only *Catharodesmus* as an endemic American genus and extending the African genus *Habrodesmus* to include many of the Neotropical species.

Recently, however, Dr. Kraus reviewed the matter and revived most of Silvestri's names for various groups of species that now seem to constitute well-marked genera. He likewise restricted *Habrodesmus* to African species, thereby disposing of a zoogeographic anomaly. Although Kraus defined and listed all species of some genera, he gave no diagnosis of *Mestosoma*, and listed only a few of the species that seem to be referable to it, so that a good treatment of the genus is still high on the list of desirable projects.

For the present, the shape of the gonopod telopodite, as shown in the drawings in the cited work by Dr. Kraus and those included with this paper, is more meaningful as a generic diagnosis than any tentative verbal characterization might be.

***Mestosoma semirugosum* (Pocock), new combination**

Figure 2

Strongylosoma semirugosum Pocock, 1888, p. 477, pl. 16, fig. d.—Chamberlin, 1918, p. 246.
Habrodesmus semirugosus Attems, 1937, p. 194.

Males and females were taken from the Fresh Water Lake at 2,000 ft. on March 26, 1956, and from Castle Bruce Junction, March 10, 24, and 30, 1956. Field notes state: "between boards," "under leaves," and "from decaying bromeliads."

The original gonopod drawings published by Pocock are small and very diagrammatic, showing nothing in the way of characters that

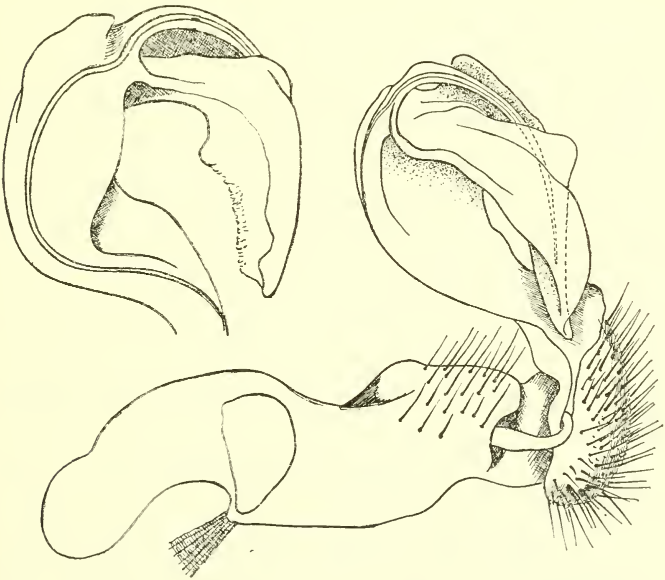

Figure 2.—*Mestosoma semirugosum* (Pocock). Left gonopod of male. Mesial aspect lower right; ventral aspect of telopodite upper left, to show the finely laciniate inner margin of the postfemur.

are now necessary for the recognition of species in *Mestosoma* and related genera; therefore, this opportunity is taken to provide more adequate illustrations. It will be noticed that the gonopods in *Mestosoma*, as well as in some related genera of the Andean region, are quite similar to those found in oriental genera such as *Orthomorphella*. The telopodite is bent into nearly a complete circle, with the postfemoral region set off by a distinct cingulum, and modified into laminae medialis and lateralis that sheath the long slender solenomerite.

The South American diplopod fauna is still very poorly known, and it is thus entirely possible that *semirugosum* was introduced into Dominica from a mainland population. But this species does not seem to be identical with any species known from the more civilized parts of the continent, whence one would logically expect the species to have been transported. So far no other species of this genus have been found elsewhere in the West Indies or on the fairly well explored island of Trinidad, and it may be that *semirugosum* is the result of introduction by rafting or some other natural means from a remote interior species.

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NOTES ON LARVAE OF NINE GENERA OF APHODIINAE IN THE UNITED STATES (COLEOPTERA : SCARABAEIDAE)

By Manohar Lal Jerath[1]

The coprophagus scarabaeid subfamily Aphodiinae contains a great many species of small to medium-sized beetles with a great diversity of habits. Most species are found in dung; some, however, are found in soil or sand feeding on organic matter or roots of living plants; others are said to be parasitic. The subfamily is worldwide in distribution.

This study of the systematics of larval Aphodiinae, begun in November 1954, was undertaken because practically nothing was known of the American genera and species. It was suggested by Dr. Paul O. Ritcher, Department of Entomology, Oregon State College, Corvallis, Oreg., and is based on the study of larvae and adults loaned from the U.S. National Museum (USNM), Dr. Ritcher's personal collection (POR) and material collected by the writer. The assistance and encouragement of Mr. O. L. Cartwright of the U.S. National Museum are gratefully acknowledged.

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Keys based on morphological differences of the known larvae of Aphodiinae of the United States are presented for separating tribes, genera, and species. Morphological differences of the epipharynges, maxillae, rasters, and lower anal lobes are used. Before the present study was undertaken, unnamed larvae of the Aphodiinae could not be assigned below the subfamily level. Now, for the first time, adequate keys permit separation of the four tribes and of 9 of the 15 genera found in the United States.

Larvae of four genera—*Aegialia*, *Aphotaenius*, *Euparia*, and *Pleurophorus*—are described for the first time from reared material and are included with *Aphodius*, *Oxyomus*, *Saprosites*, *Ataenius*, and *Psammodius* in the present study.

It is unfortunate that reared material of the remaining genera and of more species of the included genera was not available for study. Relatively extremely little reared material has been accumulated by any individual or institution. Every available known larva was examined.

Larvae of six genera of Aphodiinae from the United States are yet to be recognized and described. Larvae of *Dialytes*, *Dialytellus*, *Pseudataenius*, *Rhyssemus*, *Trichiorhyssemus*, and *Microaegialia* are unknown.

The larvae of *Aegialia* show close similarities with the larvae of Aphodiinae and in this work have been treated under the subfamily Aphodiinae in a new tribe. On the basis of larval characters the tribes of Aphodiinae can be arranged in the following order: Aegialiini, Aphodiini, Eupariini, and Psammodiini.

Review of Literature

The earliest paper on the larvae of Aphodiinae appeared in 1835, when De Hann (1835) described and discussed briefly the systematic position of *Aphodius luridus* Fabricius and *A. conjugatus* Panzer larvae. Mulsant (1842) briefly characterized the larvae of *Aphodius distinctus* Müller, *A. satellitus* Herbst, and *A. varians* Duftschmid. In 1871 he characterized larvae of *Aphodius fimetarius* (Linnaeus).

Schiodte (1874) gave diagrams and distinguishing larval characters for *Aphodius rufipes* (Linnaeus), *A. granarius* (Linnaeus), *A. fossor* (Linnaeus), and *A. brevis* Erichson. Perris (1877) published brief descriptions of *Aphodius fossor* (Linnaeus) and *A. constans* Duftschmid. Rosenhaur (1882) described and gave a key for six species of the genus *Aphodius*, but he used the characters of color and width of head capsule, which are not reliable. Hansen (1925) gave distinguishing characters for larvae of the genus *Aphodius* and wrote short descriptions for eight species.

In 1928 Hayes described the epipharynx of *Aphodius* and in 1929 he partially described and compared larvae of Aphodinae (*Aphodius*) with other scarabaeid larvae. Böving and Craighead (1931) separated *Aphodius rufipes* and *Aphodius fossor* groups in their keys to families and subfamilies of Scarabaeoidea.

Gardner (1935) described the immature stages of Scarabaeoidea from India and gave pupal and larvae characters for the genus *Aphodius* and a key for five species of the genus *Aphodius*. According to him the pupae of *Aphodius* can be separated from other scarabaeid pupae by the presence of two filamentous caudal appendages.

Madle (1934) dealt with the morphology, ecology, and physiology of the larvae and adults of *Aphodius rufipes* Linnaeus. Also, Madle (1935, 1936) gave a key to 13 species of the genus *Aphodius* and a detailed account of each species. According to his observations, the 13 species could be separated into five distinct types on the basis of the lower anal lobe, shape of the setae on the raster, and structure of the head capsule.

Paulian and Villiers (1939) were the first to describe the larva of *Heptaulacus peyerimhoff* Paulian and Villiers found in humid turf soil in Morocco. They considered *Heptaulocus* larvae to be close to *Aphodius*, especially the *rufipes* group.

Korschefsky (1940) separated larvae of Aphodiinae (*Aphodius fimetarius* (Linnaeus) and *A. fossor* (Linnaeus)) from other scarabaeid larvae in his illustrated key to German scarabaeid larvae. Van Emden (1941) separated Aphodiinae from other subfamilies of scarabaeid larvae, presenting a key to 13 species of the genus *Aphodius* and separating larvae of the genus *Saprosites* (*S. mendax* Blackburn) and the genus *Oxyomus* (*O. silvestris* Scopoli) for the first time.

Schaerffenberg (1941) gave a key for separating Aphodiinae from other scarabaeid larvae. Paulian (1942, pp. 129–131) published a description of the larvae of *Rhyssemodes orientalis* Mulsant and Godart and compared larvae of the genus *Rhyssemodes* with the larvae of the genus *Aphodius* and the genus *Ataenius*.

Carne's (1950) publication on the morphology of immature stages of *Aphodius howitti* Hope from Australia was the first paper on *Aphodius* spp. to use Böving's and Ritcher's modern terminology for the raster and epipharynx.

Medvedev (1952) published an illustrated paper on the larvae of scarabaeid beetles of the fauna of the U.S.S.R. and separated *Aphodius*, *Psammodius*, and *Cnemisus*. He described *Psammodius sulcicollis* Illiger, *Cnemisus ahngeri* Seminov, and 14 species of the genus *Aphodius*.

In addition to the above literature, a great amount of work has been done on the other subfamilies of the Scarabaeidae which is

quite applicable to a study of Aphodiinae. Among these are notable and excellent papers by Böving (1936) on the explanation for terms applied to the epipharynx and raster, and by Ritcher (1945, 1947) on the larvae of Coprinae and Geotrupinae. In this paper, these works are referred to frequently and the same terminology is used.

Larval Taxonomy

The scarabaeid subfamily Aphodiinae, as shown by a detailed morphological study of the larvae, includes four tribes—Aegialiini, Aphodiini, Eupariini, and Psammodiini. Almost all scarabaeid larvae have stridulatory teeth on the maxillae. The larvae of *Psammodius* and *Pleurophorus* of the tribe Psammodiini and *Saprosites* of the tribe Eupariini lack stridulatory teeth.

Larvae of Aphodiinae may be characterized as follows: Antenna 4-segmented (in *Aphodius* first antennal segment apparently subdivided). Third antennal segment with an apical, conical sensory organ. Fourth antennal segment small and conical, with a sensory area, and bearing sensory pegs and a seta at its tip. Epipharynx usually weakly trilobed; haptomerum with two macrosensillae. Pedium bounded on all sides by nonarticulating processes. Tormae fused mesally and produced into an epitorma. Crepide present posterior to tormae. Scissorial area of right mandible with S_{1+2} and S_{3+4}. Maxilla with cardo, stipes, galea, lacinia, and 4-segmented maxillary palp; galea and lacinia separate but close together. Galea ventrally with a row of short setae; lacinia dorsally with a row of setae near the mesal edge. Legs 4-segmented, consisting of a coxa, trochanter, femur, and tibiotarsus, the latter bearing a simple claw; claw with two short setae near the middle. Spiracular concavities facing ventrally. Anal lobes whitish or yellowish white and without setae.

Larval key to tribes of the subfamily Aphodiinae found in the United States

1. Lower anal lobe either emarginate or entire 2
   Lower anal lobe divided into two sublobes either adjacent or remote 3
2. Lower anal lobe entire (fig. 86) . . . . **Aegialiini**
   Lower anal lobe emarginate (fig. 85) . . . . **Aphodiini**
3. Maxillary stridulatory area with teeth (fig. 49), except in the genus *Saprosites* where the lacinia lacks an apical uncus (fig. 46) . . . . **Eupariini**
   Maxillary stridulatory area without teeth (fig. 50) . . . . **Psammodiini**

Tribe Aegialiini

This tribe is represented in the United States by only two of the five known genera, *Aegialia* Latreille and *Microaegialia* Brown. So far, 19 species of the genus *Aegialia* have been recorded from the

United States. Species dealt with in this study include *Aegialia blanchardi* Horn and *Aegialia lacustris* LeConte.

This tribe has been treated by taxonomists as a separate subfamily, but study of the larvae proves beyond doubt that the subfamily Aegialiinae can be included under the subfamily Aphodiinae as a separate tribe.

Larvae of the genus *Aegialia* bear the following similarities with the larvae of other Aphodiinae:

1. Setae on the frons like those found in the tribe Aphodiini, genera *Ataenius* and *Euparia*.
2. Antenna 4-segmented, which is characteristic of the subfamily Aphodiinae (in *Aphodius*, the first antennal segment apparently subdivided). Third antennal segment apically with a sensory conical structure, fourth segment small and conical.
3. Clypeus, on either side, with three setae, as in the tribes Aphodiini and Psammodiini and the genera *Ataenius* and *Euparia* of the tribe Eupariini.
4. Epipharynx resembling that of the Aphodiinae in shape, position, number of setae, and in the presence of clithra and tormae.
5. Right mandible like that of other Aphodiinae.
6. Maxilla similar to that of the Aphodiinae.
7. Body and legs with the same segmentation and setal pattern as in the Aphodiinae.
8. Raster with teges similar to those in the Aphodiinae. Anal lobes whitish and without setae.

Genus *Aegialia* Latreille

Larvae of the genus *Aegialia* may be characterized as follows: Frons, on each side, with two short posterior frontal setae and a microsensilla, a long seta at each anterior angle, a long exterior frontal seta and a microsensilla, and a short anterior frontal seta and a microsensilla. Clypeus with three setae on each side. First, second, and third antennal segments subequal; third antennal segment with a conical sensory area.

Epipharynx with protophoba tristichous on the left and monostichous on the right; dexiophoba and laeophoba monostichous; mesophoba monostichous in the middle and bistichous on the sides. Tormae asymmetrical, dexiotorma produced cephalad and caudad, laeotorma slightly produced cephalad. Crepide subcircular with two microsensillae on it and two on either side of it.

Scissorial area of left mandible with S_1, S_2 and S_{3+4} and of right mandible with S_{1+2} and S_{3+4}. Each mandible dorsally with two or three setae and ventrally with two setae. Galea ventrally with a long seta and a row of four short setae. Palpifer distinct and with one to three conical teeth.

Abdominal segments 1–7 each with three dorsal annulets; each annulet with a transverse row of setae. Segments 8–10 each with

three dorsal rows of setae, but dorsa not subdivided into annulets. Each abdominal spiracle-bearing area with 6–8 setae ventrally and three or four setae dorsally.

Tegillar setae scattered irregularly on the venter of 10th abdominal segment. Anal lobes whitish, without setae; lower anal lobe entire.

Key to known larvae of *Aegialia* Latreille

1. Galea dorsally with five stout setae; raster with 48–58 hamate tegillar setae. **lacustris** LeConte

   Galea dorsally with four stout setae; raster with 25–37 hamate setae. **blanchardi** Horn

Aegialia lacustris LeConte

Figures 25, 86

Material examined: Seven third-stage larvae and cast skins of 10 third-stage larvae reared to the adult stage, being a part of 30 larvae collected in soil under willows along the roadside toward Adel, Oreg., May 17, 1957, by Paul O. Ritcher.

Description: Maximum width of head capsule of third-stage larva 1.29–1.42 mm. Cranium yellowish white, surface smooth except for two small depressions on each side of the frons, five or six dorsoepicranial setae and three or four microsensillae on each side.

Epipharynx with 15–17 microsensillae along the base of the protophoba. Maxillary stridulatory area with an irregular row of 15–20 conical teeth. Galea dorsally with five stout setae. Lacinia dorsally with a row of six long setae near the mesal edge and a single seta posteriorly.

Abdominal segments 1–5 each with three dorsal annulets; each prescutum with 12 short setae, each scutum with 4–6 long setae and 12–14 short setae on each side, and each scutellum with 16 short setae. Raster with teges of 48–58 hamate setae curved at their distal ends.

Aegialia blanchardi Horn

Figures 2, 39, 53, 70

Material examined: One third-stage larva, associated with adults, collected under grass roots in sand dunes at Waldport, Oreg., July 16, 1955, by Paul O. Ritcher and Manohar Jerath (adults determined by O. L. Cartwright); 20 third-stage larvae and the cast skins of 10 third-stage larvae reared to the adult stage, being part of a large number collected under grass roots in sand dunes at Waldport, Oreg., June 12, 1956, by Paul O. Ritcher and Manohar Jerath; and 4 third-stage larvae, associated with adults, collected under grass roots in sand dunes at Waldport, Oreg., May 29, 1957, by Manohar Jerath.

Description: Maximum width of head capsule of third-stage larva 1.09×1.19 mm. Cranium light yellow, surface smooth except for three depressions in a line on each side on the frons, 6–8 dorsoepicranial setae and 3–5 microsensillae on each side.

Protophoba of epipharynx with 13-16 microsensillae. Maxillary stridulatory area with an irregular row of 12–16 conical teeth. Galea dorsally with four stout setae. Lacinia dorsally with a row of five or six long setae near the mesal edge and a seta posteriorly.

Dorsal annulets of abdominal segments 1–5 with setation as follows: each prescutum with 12–14 short setae, each scutum with 6–8 long setae and 20–25 short setae on each side, and each scutellum with 16–18 short setae.

Raster with teges of 25–37 hamate setae curved at their distal ends.

Tribe Aphodiini

This tribe is represented in the United States by only three of the many known genera in the world. The genus *Oxyomus* Laporte occurs only in the Eastern States; the genus *Xerospsamobeus* Saylor is known only from California. In contrast, more than 100 species of the genus *Aphodius* Illiger occur in the United States.

Species dealt with in this study include *Oxyomus silvestris* (Scopoli), the only species of this genus known in the United States, and 19 species of the genus *Aphodius*. Two of these species of *Aphodius* are from Australia, where they are pests in pastures. Six specimens were reared by the author. The others were borrowed from the U.S. National Museum and the personal collection of Paul O. Ritcher.

Larvae of this tribe may be characterized as follows: Frons, on each side, with two short posterior frontal setae and a microsensilla, a long seta at each anterior angle, a single long exterior frontal seta and a microsensilla, and a single short anterior frontal seta and a microsensilla. Frontal sutures distinct. Clypeus marked into large sclerotized postclypeus and a small weakly sclerotized preclypeus; clypeus with three setae on each side. Maxillary stridulatory area with conical teeth; palpifer differentiated. Anal lobes whitish, without setae; lower anal lobe emarginate, partially divided into sublobes, never completely divided.

Larval key to *Oxyomus* and *Aphodius*

Left mandible with S_{1+2}, S_3 and S_4 (fig. 26); galea dorsally with four stout setae (fig. 40); 9th and 10th abdominal segments strongly tapering in a concave curve (fig. 79) . . . . Oxyomus Laporte

Left mandible with S_{1+2} and S_3 (fig. 23); galea dorsally with five or more stout setae (fig. 41); 9th and 10th abdominal segment slightly tapering in a concave curve . . . . Aphodius Illiger

Oxyomus silvestris (Scopoli)

Figures 10, 13, 26, 40, 60, 71, 79

Material examined: Five third-stage larvae and two second-stage larvae collected in soil around roses at Luxemburg, May 24, 1949 (USNM).

Description: Maximum width of head capsule of third-stage larva 0.83–0.92 mm. Cranium light yellowish brown, smooth, two or three dorsoepicranial setae and two microsensillae on each side. Second and third antennal segments subequal, first longer than second or third.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 16–18 microsensillae. Laeophoba polystichous; dexiophoba monostichous; mesophoba monostichous in the middle and polystichous on the sides. Crepide subtriangular. Tormae asymmetrical, dexiotorma produced cephalad and caudad, laeotorma small and slightly produced caudad with end blunt.

Scissorial area of left mandible with S_{1+2}, S_3 and S_4, and of right mandible with S_{1+2} and S_{3+4}. Each mandible dorsally with two setae and ventrally with a single seta.

Maxillary stridulatory area with a row of seven conical teeth; palpifer with three teeth. Galea dorsally with four stout setae, ventrally with a long seta and a row of seven or eight short setae. Lacinia with terminal uncus of three ventral toothlike lobes, dorsally with a row of five long setae along the mesal edge and a short seta posteriorly.

Abdominal segments 1–6 each with three dorsal annulets; each annulet with a transverse row of setae except the last annulet of segment 6. On the annulets of segments 1–5 each prescutum with six short setae, each scutum with three long setae and three short setae on each side, and each scutellum with eight short setae. Segments 7–10 each with two transverse rows of setae but dorsa not subdivided into annulets. Segments 9 and 10 strongly tapering in a concave curve. Each abdominal spiracle-bearing area with two setae ventrally and a single seta dorsally.

Raster with two longitudinal palidia surrounded on sides by 9–14 tegillar setae. Each palidia with 7–9 caudomesally directed spine-like setae. Tegillar setae arranged in two rows, one on each side of palidia.

Genus _Aphodius_ Illiger

Larvae of the genus *Aphodius* may be characterized as follows: Frons, on each side, with two short posterior frontal setae with a microsensilla (in *A. erraticus* two or three setae with two microsensillae), a short anterior frontal seta and a microsensilla, a long exterior

frontal seta and a microsensilla and a long seta at each anterior angle. First antennal segment apparently subdivided. Scissorial area of left mandible with S_{1+2} and S_3 and of right mandible with S_{1+2} and S_{3+4}. Each mandible dorsally with two or three setae and ventrally with three or four short setae. Galea dorsally with more than four setae. Abdominal segments 1–8 each with three dorsal annulets; segments 9 and 10 each with two rows of dorsal setae, dorsa not divided. Lower anal lobe emarginate, partially subdivided into two lobes (or into four as in *A. erraticus*).

Key to known larvae of *Aphodius* Illiger

1. Raster with palidia 2
   Raster without palidia 4
2. Dexiotorma produced caudad; lacinia dorsally with a row of five or six setae along the mesal edge and a short seta posteriorly; second and third antennal segments subequal, first long 3
   Dexiotorma not produced caudad; lacinia with a row of eight or nine long setae along the mesal edge and two short setae posteriorly; first and second antennal segments subequal, third short (Australian species).
   pseudotasmaniae Given, **howitti** Hope
3. Laeotorma produced caudad; abdominal segments 6–8 dorsally with three transverse rows of setae; galea ventrally with a row of six or seven short setae; lacinia dorsally with a row of six long setae along the mesal edge and a short seta posteriorly . . . . **granarius** (Linnaeus)
   Laeotorma not produced caudad; abdominal segments 6–8 dorsally with two transverse rows of setae; galea ventrally with a row of 11 or 12 short setae; lacinia dorsally with a row of five long setae along the mesal edge and a short seta posteriorly . . . . **pardalis** LeConte
4. Maxilla with stridulatory teeth on palpifer 5
   Maxilla without stridulatory teeth on palpifer 12
5. Epipharynx with laeotorma not produced caudad 6
   Epipharynx with laeotorma produced caudad 8
6. Palpifer with three or fewer stridulatory teeth; galea ventrally with 17 or fewer short setae in a row; lacinia dorsally with six or fewer long setae in a row near the mesal edge and a short seta posteriorly; raster with less than 91 tegillar setae; each abdominal spiracle-bearing area with two setae dorsally and two setae ventrally 7
   Palpifer with more than three stridulatory teeth; galea ventrally with 18–22 short setae in a row; lacinia dorsally with a row of nine long setae near the mesal edge and a short seta posteriorly; raster with 130–165 short tegillar setae; each abdominal spiracle-bearing area with three or four setae ventrally and three setae dorsally . . . . **fossor** (Linnaeus)
7. Stridulatory area on stipes with 14–18 teeth; galea dorsally with seven setae; lacinia dorsally with a row of six long setae near the mesal edge and a short seta posteriorly; first and second antennal segments subequal, third short.
   fimetarius (Linnaeus)
   Stridulatory area on stipes with 6–10 teeth; galea dorsally with five setae; lacinia dorsally with a row of five long setae near the mesal edge and a short seta posteriorly; second and third antennal segments subequal, first long. . . . . **aleutus** Escholtz

8. Lacinia dorsally with a row of five long setae near the mesal edge and a short seta posteriorly; galea ventrally with a row of less than 11 short setae. . 9
   Lacinia dorsally with a row of eight long setae near the mesal edge and a short seta posteriorly; galea ventrally with a row of 11–14 short setae. **hamatus** Say
9. Abdominal segments 6–8 dorsally each with two transverse rows of setae. . 10
   Abdominal segments 6–8 dorsally with three transverse rows of setae; galea ventrally with a row of eight short setae; raster with 51–81 short tegillar setae; second and third antennal segments subequal, first long. **vittatus** Say
10. Galea ventrally with a row of eight or more short setae 11
   Galea ventrally with a row of six or seven short setae. Second and third antennal segments subequal, first long; maxillary stridulatory area on stipes with 8–10 teeth; raster with 36–50 tegillar setae. (Collected from ant's nest) . . . . **Aphodius** sp.
11. Second and third antennal segments subequal, first long; width of head capsule 1.82–2.05 mm.; frons on each side with two depressions. **sparsus** LeConte
   First and third antennal segments subequal, second short; width of head capsule 0.86–0.92 mm.; frons on each side with four depressions in a line. **neotomae** Fall
12. Lacinia dorsally with a row of five long setae along the mesal edge and a short seta posteriorly; spiracle-bearing area with two setae ventrally; clypeus without any protuberance; lower anal lobe emarginate, partially subdivided into sublobes; claws slender 13
   Lacinia dorsally with a row of seven or eight long setae along the mesal edge and two or three short setae posteriorly; spiracle-bearing area with 4–6 setae ventrally; clypeus with a transverse broad protuberance in the middle of anterior margin of its sclerotized part; lower anal lobe emarginate, partially subdivided into four sublobes; claws rather short. **erraticus** (Linnaeus)
13. Galea ventrally with a row of seven or more short setae 14
   Galea ventrally with a row of five short setae. Abdominal segments 6–8 dorsally each with three transverse rows of setae; second and third antennal segments subequal, first long; width of head capsule 1.41–1.70 mm.; raster with 34–47 tegillar setae . . . . **prodromus** Brahm
14. Raster with less than 43 tegillar setae 15
   Raster with more than 43 tegillar setae 17
15. Raster with more than 23 tegillar setae 16
   Raster with 17–22 tegillar setae; width of head capsule 0.89–0.96 mm. **stercorosus** Melsheimer
16. Abdominal segments 6–8 dorsally each with three transverse rows of setae; width of head capsule 1.25–1.35 mm.; frons on each side with two depressions. **lividus** (Oliver)
   Abdominal segments 6–8 dorsally each with two transverse rows of setae; width of head capsule 0.86–0.89 mm.; frons on each side with three depressions in a line . . . . **troglodytes** Hubbard
17. Abdominal segments 6–8 dorsally each with three transverse rows of setae; first and second antennal segments subequal, third short; width of head capsule 1.22–1.45 mm. . . . . **haemorrhoidalis** (Linnaeus)
   Abdominal segments 6–8 dorsally each with two transverse rows of setae; first, second and third antennal segments subequal; width of head capsule 1.32–1.35 mm. **pectoralis** LeConte

Aphodius granarius (Linnaeus)

Figures 12, 23

Material examined: Six third-stage larvae collected from hard surface soil in horse pasture June 8, 1944, at Lexington, Ky., by Paul O. Ritcher, No. 44–7B (POR); two third-stage larvae collected at San Benito, Tex., by M. P. Jones (USNM); six third-stage larvae, associated with adults, collected in soil under cow dung at airport, Corvallis, Oreg., June 9, 1955, by Manohar Jerath; seven third-stage larvae and cast skins of five third-stage larvae reared to the adult stage, collected around mint roots near Prosser, Wash., Apr. 30, 1956, by K. E. Frick and S. G. Cole (reared adults determined by O. L. Cartwright).

Description: Maximum width of head capsule of third-stage larva 1.42–1.68 mm. Cranium light yellow to yellowish brown, surface smooth except for three depressions in a vertical line on the frons on each side, three or four dorsoepicranial setae and four or five microsensillae on each side. Second and third antennal segments subequal, first segment somewhat longer than second or third.

Epipharynx with protophoba tristichous or bistichous on left and monostichous on right; protophoba with 18–21 microsensillae. Tormae similar in size and shape, both tormae produced cephalad and caudad. Crepide subcircular; epitorma asymmetrical and bent towards laeophoba.

Maxillary stridulatory area with an irregular row of 7–10 conical teeth; palpifer with one or two teeth. Galea ventrally with a long seta and a longitudinal row of six or seven short setae, dorsally with five setae. Lacinia dorsally with a row of six long setae near the mesal edge and one short seta posteriorly.

Dorsal annulets of abdominal segments 1–5 with setation as follows: each prescutum with eight short setae, each scutum with 3–5 short setae and 2–4 long setae on each side, and each scutellum with 11 or 12 short setae. Each abdominal spiracle-bearing area with two setae dorsally and two setae ventrally.

Raster on each side with three short, longitudinal palidia, surrounded on the sides by 24–35 tegillar setae. Raster with 14–23 caudomesally directed, spine-like pali. Tegillar setae arranged in more or less regular rows, with varying number of setae in each row. Four minute setae anterior to the other setae.

Aphodius pardalis LeConte

Figure 69

Material examined: Three third-stage larvae collected from decaying lawn grass at San Francisco, Calif., Feb. 16, 1935, by P. C.

Ting (POR); 11 third-stage larvae collected from beneath injured turf in golf course at Eugene, Oreg., Apr. 26, 1954, by "R. H." (POR); 20 third-stage larvae collected at golf course, Eugene, Oreg., Apr. 28, 1954, by Paul O. Ritcher (reared adults identified by O. L. Cartwright) (POR).

Description: Maximum width of head capsule of third-stage larva 1.29–1.42 mm. Cranium light yellowish brown to yellowish brown, surface smooth except two depressions on each side on the frons, three dorsoepicranial setae and four microsensillae on each side. First antennal segment longer than second or third, second and third subequal.

Epipharynx with protophoba tristichous on left and monostichous on right; protophoba with 19–21 microsensillae. Tormae not similar in size and shape, dexiotorma produced cephalad and caudad, laeotorma only produced cephalad. Crepide small and irregular in outline; epitorma asymmetrical, flattened apically and bent towards laeophoba.

Maxillary stridulatory area with an irregular row of 7–11 conical teeth; palpifer with one or two teeth. Galea ventrally with one long seta and a longitudinal row of 11 or 12 short setae, dorsally with five setae. Lacinia dorsally with a row of five long setae near the mesal edge and one short seta posteriorly.

Dorsal annulets of abdominal segments 1–5 with setation as follows: each prescutum with six short setae, each scutum with two or three long setae and 3–5 short setae on each side, and each scutellum with 10 short setae. Each abdominal spiracle-bearing area with two setae ventrally and one seta dorsally.

Raster with two short, longitudinal palidia, surrounded on the sides by scattered 16–31 tegillar setae. Each palidium with 6–10 caudomesally directed, spine-like setae.

Aphodius howitti Hope

Material examined: Fourteen third-stage larvae from "L. Chinnick," Australia (USNM).

Description: Maximum width of head capsule of third-stage larva 2.7–3.36 mm. Cranium yellowish brown to dark brown, surface smooth except for three depressions in a line on each side on the frons, four dorsoepicranial setae and three or four microsensillae on each side. First and second antennal segments subequal, third shorter than first or second. Third antennal segment with a small conical sensory structure apically.

Epipharynx with protophoba monostichous; protophoba with 18–20 microsensillae; dexiophoba bistichous. Tormae similar in size

and shape, both tormae only produced cephalad. Crepide subtriangular; epitorma small, asymmetrical.

Maxillary stridulatory area with an irregular row of 11–15 conical teeth; none on palpifer. Galea ventrally with a long seta and a longitudinal row of 10–12 short setae, dorsally with five or six setae. Lacinia dorsally with a row of eight or nine long setae near the mesal edge and two short setae posteriorly.

Abdominal segments 1–5 each with three dorsal annulets; each prescutum with 6–12 setae, each scutum with 5–7 long setae and 9–10 short setae on each side, and each scutellum with 10–22 setae. Each abdominal spiracle-bearing area with two setae ventrally and two setae dorsally.

Raster with two short longitudinal palidia, surrounded on the sides by 50–60 hamate setae curved at their distal ends. Raster with 11–15 caudomesally directed, spine-like pali. Tegillar setae arranged in more or less regular rows, with varying number of setae in each row. Two minute setae anterior to the other setae.

Aphodius pseudotasmaniae Given

Material examined: Twelve third-stage larvae collected from pasture land at Kempton, Tasmania, July 30, 1951, by E. J. Martyn (USNM).

Description: Maximum width of head capsule of third-stage larva 2.97–3.20 mm. Cranium reddish brown, surface smooth except four depressions in a line on each side on the frons; three or four dorsoepicranial setae and five microsensillae on each side. First and second antennal segments subequal, third shorter than first or second. Third antennal segment with a conical sensory area apically.

Epipharynx with monostichous protophoba; protophoba with 18–20 microsensillae; dexiophoba bistichous. Tormae similar in size and shape, both tormae only produced cephalad. Crepide subtriangular; epitorma small and asymmetrical.

Maxillary stridulatory area with an irregular row of 13–20 conical teeth; none on palpifer. Galea ventrally with a long seta and a longitudinal row of 10 or 11 short setae, dorsally with six setae. Lacinia dorsally with a row of eight long setae near the mesal edge and two short setae posteriorly.

Dorsal annulets of abdominal segments 1–5 with setation as follows: each prescutum with 6–12 setae, each scutum with 5–7 long setae and 9 or 10 short setae on each side, and each scutellum with 10–20 setae. Each abdominal spiracle-bearing area with one or two setae dorsally and two setae ventrally. Abdominal segments 7 and 8 broad, 9 and 10 narrow.

Raster with two short longitudinal palidia, surrounded on the sides by 51–55 hamate setae. Raster with 14–18 caudomesally directed pali. Tegillar setae arranged in more or less regular rows, with varying number of setae in each row. Two minute setae anterior to other setae.

Aphodius fossor (Linnaeus)

Figures 16, 17

Material examined: Two third-stage larvae collected at Riverton, N.J., June 1930, labeled by Sim (POR); nine third-stage larvae and four second-stage larvae collected in cow dung at Hyannis, Mass., June 27, 1939, by W. H. Anderson (USNM).

Description: Maximum width of head capsule of third-stage larva 3.26–3.68 mm. Cranium light reddish brown to dark reddish brown, surface smooth except for two depressions on each side on the frons, four dorsoepicranial setae and two microsensillae on each side. First and second antennal segments subequal, third shorter than first or second. Third antennal segment with a small conical sensory structure apically.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 15–18 microsensillae. Tormae not similar in size and shape, dexiotorma produced cephalad and caudad, laeotorma only produced cephalad. Crepide subtriangular; epitorma asymmetrical, slender and flattened apically.

Maxillary stridulatory area with an irregular row of 16–21 conical teeth; palpifer with 4–7 teeth. Galea ventrally with a long seta and a longitudinal row of 18–22 short setae, dorsally with eight setae. Lacinia dorsally with a row of nine long setae near the mesal edge and one short seta posteriorly.

Abdominal segments 1–5 each with three dorsal annulets; each prescutum with 12 short setae, each scutum with 2–5 long setae and 5–8 short setae on each side, and each scutellum with 16 short setae. Each abdominal spiracle-bearing area with three setae dorsally and three or four setae ventrally. Claws slender, pointed, and with only blunt nodule at the insertion of the setae.

Raster with teges of 130–165 small setae arranged more or less in rows with varying number of setae in each row.

Aphodius fimetarius (Linnaeus)

Figures 5, 14, 28, 42, 43, 52, 76, 82

Material examined: Four third-stage larvae collected and reared in cow dung at Urbana, Ill., May 28, 1931, by Carl Mohr (USNM); 22 third-stage larvae collected in cow dung at Nashville, Ark., Apr. 7, 1937, by W. H. Anderson (associated adults determined by E. A.

Chapin (USNM); 12 third-stage larvae collected in cow dung at Lexington, Ky., Apr. 24, 1944, by Paul O. Ritcher (POR); 15 third-stage larvae, associated with adults, collected in cow dropping at Salem, Oreg., July 11, 1955, by Manohar Jerath; 15 third-stage larvae, obtained by confining the adults of *Aphodius fimetarius* with fresh cow dung during spring of 1956 at Corvallis, Oreg., by Manohar Jerath.

Description: Maximum width of head capsule of third-stage larva 2.05–2.31 mm. Cranium yellowish brown to dark reddish brown, surface smooth except for three depressions in a line on each side on the frons, three or four dorsoepicranial setae and three microsensillae on each side. First and second antennal segments subequal, third shorter than first or second. Third antennal segment with a small conical sensory structure.

Epipharynx with protophoba bistichous or tristichous on left and monostichous on right; protophoba with 17–21 microsensillae. Tormae not similar in size and shape, dexiotorma produced cephalad and caudad, laeotorma only produced cephalad. Crepide subquadrangular; epitorma asymmetrical, flattened apically, and bent towards laeophoba.

Maxillary stridulatory area with an irregular row of 14–18 conical teeth; palpifer with two or three teeth. Galea ventrally with a long seta and a longitudinal row of 17 short setae, dorsally with seven setae. Lacinia dorsally with a row of six long setae near the mesal edge and one short seta posteriorly.

Abdominal segments 1–5 each with three dorsal annulets; each prescutum with eight short setae, each scutum with 4–6 short setae and 3–5 long setae on each side, and each scutellum with 10–12 short setae. Each abdominal spiracle-bearing area with two setae ventrally and one or two setae dorsally.

Raster with teges of 55–90 short setae curved at their distal ends. Tegillar setae scattered irregularly on the venter of 10th abdominal segment; four minute setae anterior to the tegillar setae.

Aphodius aleutus Eschscholtz

Material examined: Nine third-stage larvae obtained by confining adults of *A. aleutus* Eschscholtz with deer droppings from August to September 1955 at Corvallis, Oreg.; six third-stage larvae collected at Mary's Peak, 14 miles west of Corvallis, Oreg., Oct. 14, 1956, by Manohar Jerath (reared adults identified by O. L. Cartwright).

Description: Maximum width of head capsule of third-stage larva 1.52–1.68 mm. Cranium light yellowish brown to yellowish brown, surface smooth except for three depressions in a row on each side on the frons, four or five dorsoepicranial setae and three or four

microsensillae on each side. First antennal segment longer than second or third, second and third subequal.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 17–19 microsensillae. Tormae not similar in size and shape, dexiotorma produced cephalad and caudad, laeotorma only produced cephalad. Crepide subquadrangular; epitorma elongated and flattened apically.

Maxillary stridulatory area with a row of 6–10 conical teeth; palpifer with two or three teeth. Galea ventrally with a long seta and a longitudinal row of 15–17 short setae, dorsally with five setae. Lacinia dorsally with a row of five long setae near the mesal edge and one short seta posteriorly.

Dorsal annulets of abdominal segments 1–5 with setation as follows: Each prescutum with six short setae, each scutum with five or six short setae and two or three long setae on each side, and each scutellum with 11 or 12 short setae. Each abdominal spiracle-bearing area with two setae ventrally and two setae dorsally.

Raster with teges of 50–72 setae scattered on the venter of 10th abdominal segment.

Aphodius hamatus Say

Material examined: Four third-stage larvae collected from pasture at Ruby Valley, Elko County, Nev., Nov. 12, 1956, by Mark Menke.

Description: Maximum width of head capsule of third-stage larva 2.87–3.00 mm. Cranium yellowish, surface smooth except for three depressions in a line on each side on the frons, three or four dorsoepicranial setae and six or seven microsensillae on each side. First and second antennal segments subequal, third shorter than first or second. Third antennal segment with a small conical sensory structure apically.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 18–21 microsensillae. Tormae similar in size and shape, both tormae produced cephalad and caudad. Crepide subtriangular; epitorma asymmetrical, slender, and flattened apically.

Maxillary stridulatory area with a row of 9–12 conical teeth; palpifer with one or two teeth. Galea ventrally with a long seta and a longitudinal row of 11–14 short setae, dorsally with five or six setae. Lacinia dorsally with a row of eight long setae near the mesal edge and one short seta posteriorly.

Dorsal annulets of abdominal segments 1–5 with setation as follows: Each prescutum with 20–25 setae, each scutum with 14–18 short setae and 7–10 long setae on each side, and each scutellum with 30–35 setae. Each abdominal spiracle-bearing area with two setae ventrally and two setae dorsally.

Raster with teges of 32–38 hamate setae arranged in five or six rows, with varying number of setae in each row; four minute setae anterior to the tegillar setae. Raster mostly covered by setae.

***Aphodius vittatus* Say**

FIGURE 77

MATERIAL EXAMINED: 16 third-stage larvae, associated with adults, collected in cow manure at airport, Corvallis, Oreg., June 9, 1955, by Manohar Jerath (associated adults determined by O. L. Cartwright); 15 third-stage larvae, associated with adults, collected in cow manure at Oakville, Oreg., July 1, 1955, by Manohar Jerath; 20 third-stage larvae and cast skins of several third-stage larvae reared to the adult stage, being a part of many collected at Talent, Oreg., May 31, 1956, by Paul O. Ritcher (POR); 23 third-stage larvae and cast skins of several third-stage larvae reared to the adult stage, being a part of many collected three miles north of Cabin Lake, Lake County, Oreg., July 30, 1957, by Paul O. Ritcher and Manohar Jerath (No. 57–10a).

DESCRIPTION: Maximum width of head capsule of third-stage larva 1.12–1.25 mm. Cranium light yellowish brown, surface smooth except for four depressions in a line on each side on the frons, three dorsoepicranial setae and two microsensillae on each side. Second and third antennal segments subequal, first segment longer than second or third.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 13–16 microsensillae. Tormae similar in size and shape, both tormae produced cephalad and caudad. Crepide subtriangular; epitorma asymmetrical and slender.

Maxillary stridulatory area with an irregular row of 5–10 conical teeth; palpifer with one or two teeth. Galea ventrally with a long seta and a longitudinal row of eight short setae, dorsally with five setae. Lacinia dorsally with a row of five long setae near the mesal edge and one short seta posteriorly.

Dorsal annulets of abdominal segments 1–5 with setation as follows: each prescutum with six short setae, each scutum with two or three long setae and four or five short setae on each side, each scutellum with eight short setae. Each abdominal spiracle-bearing area with two setae ventrally and one or two setae dorsally. Abdominal segments 6–9 broader than segments 1–5.

Raster with teges of 51–81 short setae arranged more or less in irregular rows, with varying number of setae in each row.

***Aphodius* sp.**

MATERIAL EXAMINED: Five third-stage larvae and one second-stage larva collected in *Formica* nest 8 miles east of Silver Lake, Oreg., May 16, 1957, by Paul O. Ritcher.

Description: Maximum width of head capsule of third-stage larva 1.52–1.62 mm. Cranium light yellowish brown, surface smooth except for three depressions in a line on each side on the frons, 3–5 dorsoepicranial setae and 8–10 microsensillae on each side. Second and third antennal segments subequal, first longer than second or third.

Epipharynx with protophoba bistichous on the left and monostichous on right; protophoba with 17–19 microsensillae. Tormae similar in size and shape, both tormae produced cephalad and caudad. Crepide subtriangular to subquadrangular; epitorma asymmetrical, slender, flattened apically, and bent little towards laeophoba.

Maxillary stridulatory area with a row of 8–10 conical teeth; palpifer with one or two teeth. Galea ventrally with a long seta and a longitudinal row of six or seven short setae, dorsally with five setae. Lacinia dorsally with a row of five long setae near the mesal edge and one short seta posteriorly.

Abdominal segments 1–5 each with three dorsal annulets; each prescutum with six short setae; each scutum with three or four long setae and four or five short setae on each side; and each scutellum with 10–12 short setae. Each abdominal spiracle-bearing area with two setae dorsally and two setae ventrally.

Raster with teges of 36–50 hamate setae curved at their distal ends, setae arranged in irregular rows with variable number of setae in each row. Tegillar setae covering most of the venter of 10th abdominal segment.

Aphodius sparsus LeConte

Figures 30, 56

Material examined: Three third-stage larvae collected from *Neotoma* nest at Colma, Calif., Feb. 24, 1934, by P. C. Ting (reared adults determined by F. Blaisdell) (USNM); 14 third-stage larvae reared by Paul O. Ritcher (No. 46–10C); 20 third-stage larvae and cast skins of 10 larvae reared to the adult stage, being part of a large number collected from a wood rat's nest 20 feet above the ground on a tree in McDonald forest, Corvallis, Oreg., May 21, 1957, by Paul O. Ritcher and Manohar Jerath (reared adults determined by O. L. Cartwright).

Description: Maximum width of head capsule of third-stage larva 1.82–2.05 mm. Cranium light yellow to light yellowish brown, surface smooth except for two depressions on each side on the frons, three or four dorsoepicranial setae and two microsensillae on each side. First antennal segment longer than second or third, second and third subequal. Third antennal segment with a small circular sensory area apically.

Epipharynx with protophoba tristichous on left and bistichous on right; protophoba with 18–22 microsensillae; dexiophoba bistichous. Tormae similar in size and shape, both tormae produced cephalad and caudad. Crepide subtriangular; epitorma asymmetrical and elongated.

Maxillary stridulatory area with a row of 5–7 conical teeth; palpifer with one or two teeth. Galea ventrally with a long seta and a longitudinal row of 8–10 short setae, dorsally with five setae. Lacinia dorsally with a row of five long setae near the mesal edge and one short seta posteriorly.

Abdominal segments 1–5 each with three dorsal annulets; each prescutum with eight short setae, each scutum with three or four long setae and five or six short setae on each side, and each scutellum with 12 short setae. Each abdominal spiracle-bearing area with two setae ventrally and one seta dorsally.

Raster with teges of 41–60 setae curved at their distal ends, setae scattered irregularly on the venter of 10th abdominal segment.

Aphodius neotomae Fall

Material examined: Six third-stage larvae reared by Paul O. Ritcher (No. 46-10D).

Description: Maximum width of head capsule of third-stage larva 0.86–0.92 mm. Cranium light yellow to light yellowish brown, surface smooth except for four depressions in a line on each side on the frons, three or four dorsoepicranial setae and three microsensillae on each side. First and third antennal segments subequal, second shorter than first or third.

Epipharynx with protophoba monostichous, three or four small processes on inside between dexiophoba and protophoba; protophoba with 11–14 microsensillae. Tormae similar in size and shape, both tormae produced cephalad and caudad. Crepide small and subcircular; epitorma asymmetrical and flattened apically.

Maxillary stridulatory area with an irregular row of 6–10 conical teeth; palpifer with two or three teeth. Galea ventrally with a long seta and a longitudinal row of nine short setae, dorsally with five setae. Lacinia dorsally with a row of five long setae near the mesal edge and a short seta posteriorly.

Dorsal annulets of abdominal segments 1–5 with setation as follows: each prescutum with six short setae, each scutum with three or four short setae and three long setae on each side, and each scutellum with 10 short setae. Each abdominal spiracle-bearing area with two setae ventrally and one seta dorsally.

Raster with teges of 35–46 short setae scattered irregularly on the venter of 10th abdominal segment. Lower anal lobe swollen into two lobes, but not definitely divided.

Aphodius erraticus (Linnaeus)

Figures 3, 29, 41, 85

Material examined: Eight third-stage larvae collected in soil beneath cow dung at College Park, Md., May 28, 1939, by W. H. Anderson (reared adults determined by E. A. Chapin) (USNM).

Description: Maximum width of head capsule of third-stage larva 2.27–2.40 mm. Cranium yellowish brown, surface smooth except for three depressions in a line on each side on the frons. Clypeus with a transverse broad protuberance in middle of anterior margin of its sclerotized part, anterior angles of the latter raised into a tubercle. Second and third antennal segments subequal, first longer than second or third.

Epipharynx tristichous on left and monostichous on right; protophoba with 19–21 microsensillae. Tormae similar in size and shape, both tormae produced cephalad and caudad. Crepide subquadrangular; epitorma asymmetrical.

Maxillary stridulatory area with a row of 9–13 conical teeth; none on palpifer. Galea, ventrally with a long seta and a longitudinal row of eight or nine short setae, dorsally with six or seven setae. Lacinia dorsally with a row of seven or eight long setae near the mesal edge and two or three short setae posteriorly.

Dorsal annulets of abdominal segments 1–5 with setation as follows: each prescutum with 10 short setae, each scutum with 4–6 long setae and 11–15 short setae on each side, and each scutellum with 16 short setae. Each abdominal spiracle-bearing area with two or three setae dorsally and 4–6 setae ventrally. Claw rather short, practically cylindrical in basal half, spinules strong.

Raster with teges of 52–75 short setae arranged in more or less regular rows, with varying number of setae in each row. Four minute setae anterior to the other setae. Lower anal lobe marked into four sublobes, upper anal lobe horse-shoe-shaped.

Aphodius prodromus (Brahm)

Figure 67

Material examined: Six third-stage larvae obtained by confining the adults with horse manure during May 1944, at Lexington, Ky., by Paul O. Ritcher (No. 44–7D); two third-stage larvae obtained by confining the adults with horse manure during April 1945, at Lexington, Ky., by Paul O. Ritcher (No. 45–3A).

Description: Maximum width of head capsule of third-stage larva 1.41–1.70 mm. Cranium light yellowish brown to yellowish brown, surface smooth except for three depressions in a line on each side on the frons, four dorsoepicranial setae and two microsensillae on each

side. Second and third antennal segments subequal, first longer than second or third.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 17–19 microsensillae. Tormae similar in size and shape, both tormae produced cephalad and caudad. Crepide irregular; epitorma asymmetrical, flattened apically, and little bent towards laeophoba.

Maxillary stridulatory area with an irregular row of 8–11 conical teeth; none on palpifer. Galea ventrally with a long seta and a longitudinal row of five short setae, dorsally with five setae. Lacinia dorsally with a row of five long setae near the mesal edge and one short seta posteriorly.

Abdominal segments 1–5 each with three dorsal annulets; each prescutum with six short setae, each scutum with two or three long setae and three or four short setae on each side, and each scutellum with 10 short setae. Each abdominal spiracle-bearing area with two or three setae ventrally and one or two setae dorsally.

Raster with teges of 34–47 setae arranged more or less in irregular rows, with varying number of setae in each row; four minute setae anterior to tegillar setae.

Aphodius stercorosus Melsheimer

Figure 54

Material examined: Twelve third-stage larvae reared at Lexington, Ky., by Paul O. Ritcher (No. 44 7P(B)); 5 third-stage larvae reared at Lexington, Ky., June 20, 1945, by Paul O. Ritcher (No. 44–7P) (USNM).

Description: Maximum width of head capsule of third-stage larva 0.89–0.96 mm. Cranium light yellow, surface smooth except for two depressions on each side on the frons, two or three dorsoepicranial setae and three or four microsensillae on each side. Third antennal segment with a flattened sensory area apically. First antennal segment longer than second or third, second shorter than third.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 16–18 microsensillae. Tormae similar in size and shape, both tormae produced cephalad and caudad. Crepide subtriangular; epitorma asymmetrical and flattened apically.

Maxillary stridulatory area with an irregular row of 7–9 conical teeth; none on palpifer. Galea ventrally with a long seta and a longitudinal row of seven or eight short setae, dorsally with five setae. Lacinia dorsally with a row of five long setae near the mesal edge and one short seta posteriorly.

Dorsal annulets of abdominal segments 1–5 with setation as follows: each prescutum with six short setae, each scutum with two or three

long setae and three or four short setae on each side, and each scutellum with eight short setae. Each abdominal spiracle-bearing area with two setae ventrally and one seta dorsally.

Raster with teges of 17–22 setae arranged more or less in four rows on the venter of 10th abdominal segment.

Aphodius lividus (Olivier)

Figure 63

Material examined: Ten third-stage larvae, associated with adults, collected in cow manure at Dallas, Tex., Sept. 9, 1907, by F. C. Pratt (associated adults determined by E. A. Schwarz) (USNM).

Description: Maximum width of head capsule of third-stage larva 1.25–1.35 mm. Cranium yellowish, surface smooth except for two depressions on each side on the frons, three dorsoepicranial setae and two microsensillae on each side. First antennal segment longer than second or third, second and third subequal.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 17–19 microsensillae. Tormae similar in size and shape, both tormae produced cephalad and caudad. Crepide subtriangular; epitorma asymmetrical and flattened apically.

Maxillary stridulatory area with an irregular row of 8–12 conical teeth; none on palpifer. Galea ventrally with a long seta and a longitudinal row of eight short setae, dorsally with five setae. Lacinia dorsally with a row of five long setae near the mesal edge and a short seta posteriorly.

Dorsal annulets of abdominal segments 1–5 with setation as follows: each prescutum with eight short setae, each scutum with two or three long setae and four or five short setae on each side, and each scutellum with 12 short setae. Each abdominal spiracle-bearing area with two setae ventrally and one seta dorsally.

Raster with teges of 27–42 short setae curved at their distal ends, four minute setae anterior to the other setae. Tegillar setae scattered irregularly on the venter of 10th abdominal segment.

Aphodius troglodytes Hubbard

Figure 15

Material examined: Five third-stage larvae collected at Crescent City, Fla., Jan. 29, 1893, and June 1894 by Hubbard (USNM).

Description: Maximum width of head capsule of third-stage larva 0.86–0.89 mm. Cranium light yellow, surface smooth except for three small depressions in a line on each side on the frons and two dorsoepicranial setae and one microsensilla on each side. First antennal segment longer than second or third, second and third subequal. Third antennal segment with a flattened sensory area apically.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 13–15 microsensillae. Tormae similar in size and shape, both tormae produced cephalad and caudad. Crepide irregular; epitorma asymmetrical and flattened apically.

Maxillary stridulatory area with an irregular row of 8–11 conical teeth; none on palpifer. Galea ventrally with a long seta and a longitudinal row of eight short setae, dorsally with five setae. Lacinia dorsally with a row of five long setae near the mesal edge and one short seta posteriorly.

Annulets of abdominal segments 1–5 with setation as follows: each prescutum with six short setae, each scutum with three or four short setae and three or four long setae on each side, and each scutellum with 10 short setae. Each abdominal spiracle-bearing area with two setae ventrally and one seta dorsally. Tenth abdominal segment narrows considerably.

Raster with teges of 26–32 hamate setae curved at their distal ends, setae arranged more or less in rows with varying number of setae in each row.

Aphodius haemorrhoidalis (Linnaeus)

FIGURE 55

MATERIAL EXAMINED: Twelve third-stage larvae collected in cow dung at Hyannis, Mass., June 27, 1939, by Wm. H. Anderson (USNM); 35 third-stage larvae obtained by confining the adults with fresh cow manure from Apr. 27 to May 26, 1944, at Lexington, Ky., by Paul O. Ritcher (Nos. 44-7C(1), 44-7C(2), 44-7C(3)).

DESCRIPTION: Maximum width of head capsule of third-stage larva 1.22–1.45 mm. Cranium light yellow to light yellowish brown, surface smooth except for two depressions on the frons on each side, two or three dorsoepicranial setae and three or four microsensillae on each side. First and second antennal segments subequal, third shorter than first or second.

Epipharynx with protophoba polystichous on left and monostichous on right; protophoba with 15–17 microsensillae. Tormae similar in size and shape, both tormae produced cephalad and caudad. Crepide small and irregular; epitorma asymmetrical.

Maxillary stridulatory area with an irregular row of 7–10 conical teeth, none on palpifer. Galea ventrally with a long seta and a longitudinal row of 8–10 short setae, dorsally with five or six setae. Lacinia dorsally with a row of five long setae near the mesal edge and one short seta posteriorly.

Dorsal annulets of abdominal segments 1–5 with setation as follows: each prescutum with six short setae, each scutum with two or three long setae and three or four short setae on each side, and each scutellum with eight short setae. Each abdominal spiracle-bearing area

with two setae ventrally and one seta dorsally. Abdominal segments 7–9 broader than the other segments.

Raster with teges of 51–81 short setae scattered irregularly on the venter of 10th abdominal segment.

Aphodius pectoralis LeConte

Material examined: Three third-stage larvae and cast skins of seven third-stage larvae reared to the adult stage, collected under deer droppings at Kiwanda dunes, Pacific City, Oreg., Aug. 7, 1955, by Mrs. D. McKey Fender (reared adults determined by O. L. Cartwright).

Description: Maximum width of head capsule of third-stage larva 1.32–1.35 mm. Cranium yellowish brown, surface smooth except for one depression on each side on the frons, three dorsoepicranial setae and three or four microsensillae on each side. First, second, and third antennal segments subequal.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 16–18 microsensillae. Tormae similar in size and shape, both tormae produced cephalad and caudad. Crepide subtriangular; epitorma asymmetrical, flattened apically and little bent towards laeophoba.

Maxillary stridulatory area with an irregular row of 9–12 conical teeth; none on palpifer. Galea ventrally with a long seta and a longitudinal row of nine or ten short setae, dorsally with five setae. Lacinia dorsally with a row of five long setae near the mesal edge and one short seta posteriorly.

Dorsal annulets of abdominal segments 1–5 with setation as follows: each prescutum with six short setae, each scutum with three or four short setae and three or four long setae on each side, and each scutellum with eight short setae. Each abdominal spiracle-bearing area with two setae ventrally and one seta dorsally.

Raster with teges of 57–68 short setae scattered irregularly on the venter of 10th abdominal segment.

Tribe Eupariini

This tribe is represented in the United States by 8 of the 14 known genera—*Euparia* Serville, *Ataenius* Harold, *Dialytes* Harold, *Euparixia* Brown, *Pseudataenius* Brown, *Saprosites* Redtenbacher, *Dialytellus* Brown, and *Aphotaenius* Cartwright. *Euparia*, *Euparixia*, *Pseudataenius*, *Saprosites*, and *Aphotaenius* are represented by single species only.

Species dealt with in this study include *Aphotaenius carolinus* (Van Dyke), *Saprosites pygmaeus* Harold, *Euparia castanea* Serville, and 12 species of the genus *Ataenius*.

These larvae were obtained largely from the U.S. National Museum; two species of *Ataenius* were from Paul O. Ritcher's personal collection.

Four genera studied here represent two clearly separable subgroups. *Ataenius* and *Euparia* belong in one group on the basis of the setae on the frons and clypeus, antennal segments, shape of the tormae, and the number of the tegillar setae on the raster. *Aphotaenius* and *Saprosites* fall in a second group which lacks posterior frontal and anterior frontal setae. In the same group, the clypeus has one seta on each side, the galea has four dorsal setae, and the raster has but few setae.

In a personal communication, O. L. Cartwright of the U.S. National Museum expresses the same idea concerning the relationships of genera based on the adults of this tribe.

Key to larvae of four genera of the tribe Eupariini

1. Clypeus with one seta on each side; frons without posterior frontal and anterior frontal setae; maxillary stridulatory area either without teeth or with less than five teeth; raster with less than 23 tegillar setae 2

   Clypeus with three setae on each side; frons with two posterior frontal setae and one anterior frontal seta; maxillary stridulatory area with more than seven teeth; raster with more than 25 tegillar setae 3

2. First, second, and third antennal segments subequal; lacinia without terminal uncus; maxillary stridulatory area without teeth; raster with 10–12 tegillar setae . . . . **Saprosites** Redtenbacher

   Second and third antennal segments subequal, first short; lacinia with terminal uncus; galea ventrally with six or seven short setae; maxillary stridulatory area with four or five conical teeth; raster with 19–23 tegillar setae. **Aphotaenius** Cartwright

3. Galea ventrally with a row of six or seven short setae, dorsally with four stout setae . . . . **Euparia** Serville

   Galea ventrally with a row of four or five short setae, dorsally with three stout setae . . . . **Ataenius** Harold

Saprosites pygmaeus Harold

Figures 7, 46, 62, 68, 83, 88

Material examined: Two third-stage larvae, associated with adults, collected under rotten logs at Kalawas, Oahu, Hawaii, Mar. 1, 1931, by "O. H. S." (USNM); four third-stage larvae and two second-stage larvae collected at Palmyra Island, February 1948, by N. L. H. Krauss (USNM).

Description: Maximum width of head capsule of third-stage larva 0.63–0.69 mm. Cranium light yellow, surface smooth. Frons on each side with one long exterior frontal seta and a seta in each anterior angle. Five dorsoepicranial setae and three microsensillae on each side. First, second, and third antennal segments subequal, fourth

short and conical. Clypeus not marked into preclypeus and postclypeus; clypeus with one seta on each side.

Epipharynx slightly longer than broad. Protophoba bistichous and with 7–9 microsensillae; dexiophoba polystichous; laeophoba and mesophoba monostichous. Crepide small with six microsensillae. Tormae asymmetrical, dexiotorma produced cephalad and caudad, laeotorma only produced caudad and twice as long as dexiotorma.

Scissorial area of left mandible with S_1, S_2, S_3, and S_4, and of right mandible with S_1, S_2 and S_{3+4}. Each mandible dorsally with two setae and ventrally with a single seta.

Maxillary stridulatory area without teeth; palpifer not differentiated. Galea with a single apical uncus, dorsally with four stout setae and ventrally with a single long seta and a row of three short setae. Lacinia without terminal uncus, dorsally with four stout setae near the mesal edge and a short seta posteriorly. Labial palps 1-segmented; four microsensillae and a pair of short setae on the glossa between the labial palps.

Legs with tibiotarsus small, nearly twice as long as broad, bearing a simple claw.

Abdominal segments 1–8 each with three dorsal annulets, a prescutum, a scutum, and a scutellum; each annulet with a transverse row of setae except the last annulet of segments 6–8. Segments 7–9 broad but segment 10 distinctly narrow. Segment 9 with two dorsal annulets, each annulet with a transverse row of setae; segment 10 with one transverse row of setae. Each abdominal spiracle-bearing area with two setae ventrally and one or two setae dorsally.

Raster with teges of 10–12 hamate setae placed more or less regularly in four rows; the outer row of one or two setae and inner row of four setae each; setae curved at their distal ends. Lower anal lobe divided into two closely placed sublobes.

Aphotaenius carolinus (Van Dyke)

Figures 11, 18, 34, 35, 47, 57, 74

Material examined: Four third-stage larvae reared by O. L. Cartwright, Nov. 14, 1941 (USNM).

Description: Maximum width of head capsule of third-stage larva 0.68–0.73 mm. Cranium light yellow, surface smooth. Frons on each side with a long exterior frontal seta and a seta in each anterior angle. Four or five dorsoepicranial setae on each side. Second and third antennal segments subequal, first smaller than second or third. Clypeus faintly marked into a small preclypeus and large postclypeus; clypeus with a single seta on each side.

Epipharynx slightly broader than long. Protophoba bistichous on left and monostichous on right and with 11–14 microsensillae. Meso-

phoba occupied by series of hairlike structures, arranged irregularly. Crepide small; epitorma asymmetrical. Tormae not similar in size and shape; only dexiotorma produced cephalad and caudad.

Maxillary stridulatory area with an irregular row of four or five blunt teeth; none on palpifer. Galea dorsally with four stout setae, ventrally with a long seta and a longitudinal row of six or seven short setae. Lacinia with a terminal uncus of two ventral toothlike lobes, dorsally with a row of four or five long setae near the mesal edge and a short seta posteriorly. Palpifer not differentiated.

Abdominal segments 1–5 each with three dorsal annulets; each annulet with a transverse row of setae. Segment 6 with two dorsal annulets, each with a transverse row of setae. Segments 7–9 each with two transverse rows of setae but dorsa not divided. Dorsa of segment 10 with a single transverse row of setae. Each abdominal spiracle-bearing area with two setae ventrally and one or two setae dorsally.

Raster with teges of 19–23 hamate setae arranged more or less in four rows of 5–7 setae in the inner rows and 4–6 setae in the outer rows; setae more or less caudally directed. Lower anal lobe divided into two laterally placed sublobes.

Euparia castanea Serville

FIGURES 4, 20, 24, 31, 44, 45, 61

MATERIAL EXAMINED: Four third-stage larvae and two second-stage larvae, labeled "2393, box 9/129, Selma, Ala." (USNM).

DESCRIPTION: Maximum width of head capsule of third-stage larva 1.35–1.42 mm. Cranium light yellow, surface smooth. Frons on each side with two short posterior frontal setae and a microsensilla, a short anterior frontal setae and a microsensilla, a long exterior frontal seta and a microsensilla, and a long seta at each anterior angle. Frontal sutures indistinct. Second and third antennal segments subequal, first longer than second or third. Clypeus not marked into preclypeus and postclypeus; clypeus with three setae on each side.

Epipharynx slightly broader than long. Protophoba bistichous on left and monostichous on right; protophoba with 18 or 19 microsensillae. Laeophoba polystichous and mesophoba monostichous. Crepide W-shaped and with two microsensillae. Tormae asymmetrical, dexiotorma produced cephalad and caudad, laeotorma weakly sclerotized and slightly produced caudad and cephalad.

Scissorial area of left mandible with S_1, S_2, S_3 and S_4 and of right mandible with S_{1+2} and S_{3+4}. Each mandible dorsally with two setae.

Maxillary stridulatory area with an irregular row of numerous small blunt teeth. Galea with a single apical uncus, dorsally with four stout setae and ventrally with a long seta and a row of six or seven

short setae. Lacinia with a terminal uncus of two ventral toothlike lobes, dorsally with a row of five long setae near the mesal edge and a short seta posteriorly. Palpifer indistinct.

Abdominal segments 1–6 each with three dorsal annulets; each annulet with a transverse row of setae except the last annulet of segment 6. Segments 7 and 8 each with two dorsal annulets, each annulet with a transverse row of setae. Dorsa of segments 9 and 10 each with a transverse row of setae. Each abdominal spiracle-bearing area with two setae ventrally and one seta dorsally.

Raster with teges of 55–71 hamate setae scattered irregularly on the venter of 10th abdominal segment. Setae curved at their distal ends. Lower anal lobe divided into two adjacent sublobes.

Genus *Ataenius* Harold

Larvae of this genus may be characterized as follows: Frons on each side with two posterior frontal setae and a microsensilla, a long seta at each anterior angle, a single long exterior frontal seta and a microsensilla, and a short anterior frontal seta and a microsensilla. Each antennal base with two long setae and one short seta exterolaterally and a long seta dorsally. Second and third antennal segments subequal, first long. Tormae asymmetrical; dexiotorma produced cephalad and caudad into an armlike structure; laeotorma shorter than dexiotorma and slightly produced cephalad and caudad with ends blunt. Scissorial area of left mandible with S_{1+2}, S_3 and S_4. Galea ventrally with four or five short setae, dorsally with three stout setae. Lacinia dorsally with a row of five long setae near the mesal edge and a short seta posteriorly. Labial palp 2-segmented. Spiracular concavity facing ventrally. Lower anal lobe divided into two distinct sublobes.

Key to known larvae of *Ataenius*

1. Seventh and eighth abdominal segments broad, ninth and tenth abdominal segments narrow (fig. 81) 4
   Seventh to tenth abdominal segments similar in breadth (fig. 80) 2
2. Raster with teges of 28–36 setae; blunt stridulatory teeth on stipes 8–11 . . 3
   Raster with teges of 41 setae; conical stridulatory teeth on stipes 15 (2 depressions on each side on the frons) . . . . . . **Ataenius** sp. (*strigatus* group)
3. Each mandible ventrally without setae; labium with one microsensilla for each two processes in the transverse row of closely appressed processes on glossa . . . . **Ataenius** sp. (*strigatus* group)
   Each mandible ventrally with two setae; labium with one microsensilla for each process in the transverse row of closely appressed processes on glossa. **saxatilis** Cartwright
4. Stridulatory teeth on stipes 19 or fewer 5
   Stridulatory teeth on stipes 20 or more 8

5. Raster with teges of more than 39 setae 6
   Raster with teges of fewer than 39 setae (27–31, 34–37) (each mandible dorsally with two setae and ventrally with two setae; conical stridulatory teeth on stipes 13–19) . . . . **ovatulus** Horn
6. Frontal sutures distinct 7
   Frontal sutures indistinct (blunt stridulatory teeth on stipes 12–15) **Ataenius** sp. (*strigatus* group)
7. Conical stridulatory teeth on stipes 13–16; raster with teges of 50–56 setae. **strigicauda** Bates
   Blunt stridulatory teeth on stipes 9–11; raster with teges of 40 setae. **brevis** Fall
8. Raster with teges of 50 or fewer setae 9
   Raster with teges of 54 setae (blunt stridulatory teeth on stipes 21–23; each mandible with two setae dorsally and two setae ventrally). **schwarzi** (Linell)
9. Clypeus not marked into preclypeus and postclypeus; lower anal lobe divided into two distinct sublobes placed remote from each other 10
   Clypeus marked into preclypeus and postclypeus; lower anal lobe divided into two adjacently placed sublobes 11
10. Raster with teges of 44–50 hamate setae; width of head capsule 1.32–1.35 mm. **erratus** Fall
    Raster with teges of 34–43 hamate setae; width of head capsule 1.02–1.12 mm. **imbricatus** Melsheimer
11. Stridulatory teeth on stipes 20–25; each mandible with two setae dorsally and one seta ventrally; width of head capsule 1.06–1.12 mm. **plantensis** (Blanchard)
    Stridulatory teeth on stipes 28–34; each mandible with two setae dorsally and two setae ventrally; width of head capsule 1.29–1.32 mm. . . . **Ataenius** sp.

Ataenius sp. 1 (*strigatus* group)

FIGURE 8

MATERIAL EXAMINED: One third-stage larva, associated with adults, collected at U.S. Golf Association, Washington, D.C., July 1, 1924, by M. C. Biber (POR). [This larva was associated with adults of *A. spretulus* (Haldeman) and *A. strigatus* (Say). Other species in the group may occur in the same area.]

Description: Maximum width of head capsule of third-stage larva 1.19 mm. Cranium brownish yellow, subsurface smooth except for two depressions on each side on the frons. Three dorsoepicranial setae and two microsensillae on each side. Frontal sutures distinct. Clypeus divided into smaller preclypeus and large postclypeus.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 16 microsensillae; mesophoba polystichous. Crepide small and subcircular; epitorma asymmetrical, flattened apically and bent towards laeophoba.

Mandibles brownish yellow with scissorial and molar area dark brown. Each mandible dorsally with a single seta, ventrally with two setae. Brustia well developed on left mandible but not so developed on right mandible.

Maxillary stridulatory area with an irregular row of 15 conical teeth facing cephalad; small toothlike markings behind the plectrum and on cardo. Galea ventrally with a long seta and a row of four short setae.

Abdominal segments 1–6 each with three dorsal annulets; each annulet with a transverse row of setae except the last annulet of segment 6. On the annulets of segments 1–5 each prescutum with six short setae, each scutum with three long setae and three short setae on each side, and each scutellum with 10 short setae. Segments 7 and 8 each with two dorsal annulets and each annulet with a transverse row of setae; segments 9 and 10 each with two transverse rows of closely placed setae but dorsa not divided.

Raster with teges of 41 hamate setae scattered irregularly on the venter of 10th abdominal segment, three or four long setae on each side. Lower anal lobe divided into two adjacent sublobes.

Ataenius sp. 2 (*strigatus* group)

Material examined: One third-stage larva collected in soil at Lamont, Wis., Aug. 16, 1940, by Seaton (reared adults determined by E. A. Chapin) (USNM). [The reared adults were determined as *A. falli* Hinton, a synonym of *A. spretulus* (Haldeman). A soil-collected larva might have been either this species or *A. strigatus* (Say).]

Description: Maximum width of head capsule of third-stage larva 1.22 mm. Cranium light yellow, surface smooth. Three dorsoepicranial setae and two microsensillae on each side. Frontal sutures distinct. Clypeus marked into smaller preclypeus and large postclypeus.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 16 microsensillae; mesophoba polystichous. Crepide small and subcircular; epitorma asymmetrical, flattened apically and bent towards laeophoba.

Mandibles yellowish brown with scissorial and molar area reddish brown. Each mandible dorsally with one long seta and one short seta, ventrally without setae. Brustia well developed on left mandible, but not so developed on right mandible.

Maxillary stridulatory area with a row of 10 or 11 blunt teeth, facing cephalad; small toothlike markings behind the plectrum and on cardo. Galea ventrally with one long seta and a row of four short setae.

Abdominal segments 1–8 each with three dorsal annulets; each annulet with a transverse row of setae except the last annulet of segments 6–8. On the annulets of segments 1–5 each prescutum with six short setae, each scutum with three long setae and three short

setae on each side, and each scutellum with 10 short setae. Abdominal segments 7–10 similar in breadth; segments 9 and 10 each with two transverse rows of closely placed setae, but dorsa not divided.

Raster with teges of 36 hamate setae scattered irregularly on the venter of 10th abdominal segment, three long and slender setae on each side. Lower anal lobe divided into two adjacent sublobes.

Ataenius saxatilis Cartwright

Figures 1, 19, 27, 32, 48, 58, 78, 80, 84

Description based on the following material:

Material examined: 30 third-stage larvae reared in soil from type locality July 31 to Sept. 2, 1949, by O. L. Cartwright (USNM); 10 third-stage larvae reared in sand from type locality Nov. 18, 1952, by O. L. Cartwright (USNM).

Description: Maximum width of head capsule of third-stage larva 1.02–1.09 mm. Cranium light yellow, surface smooth. Three dorsoepicranial setae on each side. Frontal sutures distinct. Clypeus not marked into preclypeus and postclypeus.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 17–19 microsensillae; laeophoba polystichous; dexiophoba and mesophoba monostichous. Crepide small and subcircular; epitorma asymmetrical, bilobed apically and bent towards laeophoba.

Mandibles yellowish brown with scissorial and molar area reddish brown. Each mandible dorsally with two setae, ventrally with two or three setae. Brustia well developed on left mandible but weak and indistinct on right mandible.

Maxillary stridulatory area with a row of 8–10 blunt teeth; small toothlike markings behind the plectrum and on cardo. Galea ventrally with a long seta and a row of four of five short setae. Palpifer distinct.

Abdominal segments 1–6 each with three dorsal annulets; each annulet with a transverse row of setae, except the last annulet of segment 6. Dorsal annulets of segments 1–5 with setation as follows: each prescutum with six short setae, each scutum with three short setae and three long setae on each side, and each scutellum with 10 short setae. Segments 7 and 8 each with two dorsal annulets and each annulet with a transverse row of setae. Segments 9 and 10 each with two closely placed transverse rows of setae, but dorsa not divided. Each abdominal spiracle-bearing area with two setae ventrally and one seta dorsally.

Raster with teges of 28–35 hamate setae with curved tips, setae scattered irregularly, five or six long setae on either side. Lower anal lobe divided into two sublobes remote from each other.

Ataenius ovatulus Horn

FIGURE 49

MATERIAL EXAMINED: Six third-stage larvae reared Nov. 15, 1941, by O. L. Cartwright (USNM); three third-stage larvae collected at River Falls, S.C., Aug. 27, 1942, by O. L. Cartwright (USNM).

DESCRIPTION: Maximum width of head capsule of third-stage larva 0.89–0.99 mm. Cranium yellowish brown, surface smooth except for two depressions on each side on the frons. Three dorsoepicranial setae and two microsensillae on each side. Frontal sutures distinct. Clypeus distinctly divided into preclypeus and postclypeus.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 16–18 microsensillae; mesophoba monostichous in the middle and polystichous on the sides. Crepide small and subcircular; epitorma asymmetrical and flattened apically.

Mandibles light yellowish brown with scissorial and molar area dark brown. Each mandible dorsally with two setae and ventrally with two setae. Brustia equally developed on both the mandibles.

Maxillary stridulatory area with an irregular row of 13–19 conical teeth facing cephalad; small toothlike markings behind the plectrum and on cardo. Galea ventrally with a long seta and a row of four short setae.

Abdominal segments 1–8 each with three dorsal annulets; each annulet with a transverse row of setae except the last annulet of segments 6–8. On the annulets of segments 1–5 each prescutum with six short setae, each scutum with three long setae and three short setae on each side, and each scutellum with 10 short setae. Segments 7 and 8 broad; segments 9 and 10 narrow, each with two transverse rows of closely placed setae but dorsa not divided.

Raster with teges of 26–31 and 34–37 hamate setae scattered irregularly on the venter of 10th abdominal segment, three long and slender setae on each side. Lower anal lobe divided into two adjacent sublobes.

Ataenius sp. 3 (*strigatus* group)

FIGURES 33, 59, 75

MATERIAL EXAMINED: Four third-stage larvae collected under grass roots July 18, 1939, at Philadelphia, Pa. (USNM). [These larvae were collected with one newly emerged adult of *Ataenius spretulus* (Haldeman) but others in the *strigatus* group are found in the same area.]

DESCRIPTION: Maximum width of head capsule of third-stage larva 1.32–1.35 mm. Cranium yellowish brown, surface smooth. Three

dorsoepicranial setae and two microsensillae on each side. Frontal sutures distinct. Clypeus distinctly divided into smaller preclypeus and large postclypeus.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 16–18 microsensillae; mesophoba polystichous. Crepide flask-shaped; epitorma asymmetrical, flattened apically and bent towards laeophoba.

Mandibles yellowish brown with scissorial and molar area dark brown. Each mandible dorsally with a single seta, ventrally without setae.

Maxillary stridulatory area with an irregular row of 12–15 teeth pointing cephalad. Galea ventrally with a long seta and a row of four or five short setae.

Abdominal segments 1–6 each with three dorsal annulets; each annulet with a transverse row of setae except the last annulet of segment 6. On the annulets of segments 1–5 each prescutum with six short setae, each scutum with three long setae and three short setae on each side, and each scutellum with 10 short setae. Segments 7 and 8 broad, each segment with two dorsal annulets and each annulet with a transverse row of setae. Segments 9 and 10 narrow, each with two transverse rows of closely placed setae but dorsa not divided.

Raster with teges of 40–45 hamate setae scattered irregularly on the venter of 10th abdominal segment, four or five long slender setae on each side. Lower anal lobe divided into two sublobes placed laterally.

Ataenius strigicauda Bates

FIGURE 81

MATERIAL EXAMINED: Six third-stage larvae and two second-stage larvae reared in original soil Aug. 26 to Sept. 29, 1945, by O. L. Cartwright (USNM).

DESCRIPTION: Maximum width of head capsule of third-stage larva 1.32–1.38 mm. Cranium light yellow, surface smooth. Three dorsoepicranial setae and two microsensillae on each side. Frontal sutures distinct. Clypeus distinctly divided into smaller preclypeus and large postclypeus.

Epipharynx with clithra enlarged mesally. Protophoba bistichous on left and monostichous on right, with 16–18 microsensillae; mesophoba monostichous in the middle and polystichous on the sides. Crepide small and subcircular; epitorma asymmetrical and flattened apically.

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Mandibles yellowish brown with scissorial and molar area reddish brown. Each mandible dorsally with two setae, ventrally with two setae, brustia well developed on left mandible but not so on right mandible.

Maxillary stridulatory area with an irregular row of 13–16 conical teeth facing cephalad; small toothlike markings behind the plectrum and on cardo. Galea ventrally with a long seta and a row of five short setae.

Abdominal segments 1–6 each with three dorsal annulets; each annulet with a transverse row of setae except the last annulet of segment 6. On the annulets of segments 1–5 each prescutum with six short setae, each scutum with four long setae and three short setae on each side, and each scutellum with 10 short setae. Segments 7 and 8 broad, each segment with two dorsal annulets and each annulet with a transverse row of setae. Segments 9 and 10 narrow, each with two transverse rows of closely placed setae but dorsa not divided.

Raster with teges of 50–56 hamate setae scattered irregularly on the venter of 10th abdominal segment, three or four long setae on either side. Lower anal lobe divided into two sublobes placed close to each other.

Ataenius brevis Fall

Material examined: One third-stage larva, associated with adults, collected at River Falls, S.C. Aug. 27, 1942, by O. L. Cartwright (USNM).

Description: Maximum width of head capsule of third-stage larva 1.09 mm. Cranium yellowish brown, surface smooth. Five dorsoepicranial setae and two microsensillae on each side. Frontal sutures distinct. Clypeus distinctly divided into smaller preclypeus and large postclypeus.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 15 microsensillae; mesophoba monostichous in the middle and polystichous on the sides. Crepide small and semicircular; epitorma asymmetrical, flattened, bilobed apically and bent towards laeophoba.

Mandibles yellowish brown with scissorial and molar area dark brown. Each mandible dorsally with a single seta, ventrally with two setae. Brustia poorly developed on right mandible.

Maxillary stridulatory area with an irregular row of 9–11 blunt teeth facing cephalad; small toothlike marking behind the plectrum and on cardo. Galea ventrally with a long seta and a row of four short setae.

Abdominal segments 1–6 each with three dorsal annulets; each annulet with a transverse row of setae except the last annulet of

segment 6. On the annulets of segments 1–5 each prescutum with six short setae, each scutum with four long setae and three short setae on each side, and each scutellum with 10 short setae. Segments 7 and 8 broad, each segment with two dorsal annulets and each annulet with a transverse row of setae. Segments 9 and 10 narrow, each with two dorsal rows of closely placed setae but dorsa not divided.

Raster with teges of 40 hamate setae scattered irregularly on the venter of 10th abdominal segment, four or five long setae on each side. Lower anal lobe divided into two sublobes placed close to each other.

Ataenius schwarzi (Linell)

Material examined: One third-stage larva reared, killed in hot water, and preserved in alcohol Oct. 16, 1944, by O. L. Cartwright (USNM).

Maximum width of head capsule of third-stage larva 1.09 mm. Cranium light yellow, surface smooth. Four or five dorsoepicranial setae on each side. Frontal sutures distinct. Clypeus distinctly divided into a smaller preclypeus and large postclypeus.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 15 microsensillae; mesophoba polystichous. Crepide small and subcircular; epitorma asymmetrical and flattened apically.

Mandibles brownish yellow with scissorial and molar area dark brown. Each mandible dorsally with two setae, ventrally with two setae. Brustia well developed on both mandibles.

Maxillary stridulatory area with an irregular row of 21–23 blunt teeth facing cephalad. Galea ventrally with a long seta and a row of five short setae.

Abdominal segments 1–6 each with three dorsal annulets; each annulet with a transverse row of setae except the last annulet of segment 6. On the annulets of segments 1–5 each prescutum with six short setae, each scutum with three long setae and four short setae on each side, and each scutellum with 10 short setae. Segments 7 and 8 broad, each segment with two dorsal annulets and each annulet with a transverse row of setae. Segments 9 and 10 narrow, each with two transverse rows of closely placed setae but dorsa not divided.

Raster with teges of 54 hamate setae curved at their distal ends, two or three long slender setae on each side. Lower anal lobe divided into two adjacent sublobes.

Ataenius erratus Fall

Material examined: One third-stage larva and 11 second-stage larvae reared in soil, cow manure, and dry cereal Sept. 3, 1942, at Clemson, S.C., by O. L. Cartwright (USNM); two third-stage and

six second-stage larvae reared in cow dung and sand Nov. 18, 1942, by O. L. Cartwright (USNM).

Description: Maximum width of head capsule of third-stage larva 1.32–1.35 mm. Cranium yellowish, surface smooth. Three dorsoepicranial setae and two microsensillae on each side. Frontal sutures distinct. Clypeus not marked into preclypeus and postclypeus.

Epipharynx with protophoba tristichous on left and monostichous on right; protophoba with 17–19 microsensillae; mesophoba polystichous. Crepide small and subcircular; epitorma asymmetrical, flattened, bilobed apically and bent towards laeophoba.

Mandibles light yellowish brown with scissorial and molar area dark brown. Each mandible dorsally with two setae, ventrally with one seta. Brustia poorly developed on right mandible.

Maxillary stridulatory area with an irregular row of 24–28 conical teeth facing cephalad; small toothlike markings behind the plectrum and on cardo. Galea ventrally with a long seta and a row of four or five short setae.

Abdominal segments 1–8 each with three dorsal annulets; each annulet with a transverse row of setae except the last annulet of segments 6–8. On the annulets of segments 1–5, each prescutum with six short setae, each scutum with three long setae and three short setae on each side, and each scutellum with 10 short setae. Segments 7 and 8 broad, 9 and 10 narrow, each with two transverse rows of closely placed setae but dorsa not divided.

Raster with teges of 44–50 hamate setae curved at their distal ends; two or three long and slender setae on each side. Lower anal lobe divided into two sublobes placed remote from each other.

Ataenius imbricatus (Melsheimer)

Material examined: Twelve third-stage larvae reared Apr. 28 to June 2, 1944, at Clemson, S.C., by O. L. Cartwright (USNM).

Description: Maximum width of head capsule of third-stage larva 1.02–1.12 mm. Cranium light yellow, surface smooth except for two depressions on each side on the frons. Three dorsoepicranial setae and two microsensillae on each side. Frontal sutures distinct. Clypeus not marked into preclypeus and postclypeus.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 13–15 microsensillae; mesophoba monostichous in the middle and polystichous on the sides. Crepide small and subcircular; epitorma asymmetrical, flattened apically and bent towards laeophoba.

Mandibles light yellowish brown with scissorial and molar area reddish brown. Each mandible dorsally with two setae, ventrally

with one or two setae. Brustia poorly developed on right mandible.

Maxillary stridulatory area with an irregular row of 21–24 conical teeth facing cephalad; small toothlike markings behind the plectrum and on cardo. Galea ventrally with a long seta and a row of four or five short setae.

Abdominal segments 1–8 each with three dorsal annulets; each annulet with a transverse row of setae except the last annulet of segments 6–8. On the annulets of segments 1–5, each prescutum with six short setae, each scutum with four long setae and three short setae on each side, and each scutellum with 10 short setae. Segments 7 and 8 broad; 9 and 10 narrow, each with two transverse rows of closely placed setae but dorsa not divided.

Raster with teges of 34–43 hamate setae curved at their outer ends; three long and slender setae on either side. Lower anal lobe divided into two sublobes remote from each other.

Ataenius platensis (Blanchard)

Material examined: Three third-stage larvae and three second-stage larvae reared in cow manure Sept. 2, 1942, at Clemson, S.C., by O. L. Cartwright (USNM); three third-stage larvae reared in cow dung and sand Nov. 18, 1942, by O. L. Cartwright (USNM).

Maximum width of head capsule of third-stage larva 1.06–1.12 mm. Cranium light yellow, surface smooth. Three dorsoepicranial setae and two microsensillae on each side. Frontal sutures distinct. Clypeus divided into a smaller preclypeus and large postclypeus.

Epipharynx with clithra enlarged mesally; protophoba bistichous on left and monostichous on right, with 15–17 microsensillae; mesophoba polystichous. Crepide small and subsquare; epitorma asymmetrical and flattened apically.

Mandibles light yellowish brown with scissorial and molar area dark brown. Each mandible dorsally with two setae, ventrally with a single short seta. Brustia poorly developed on right mandible.

Maxillary stridulatory area with an irregular row of 20–25 conical teeth facing cephalad; small toothlike markings behind the plectrum and on cardo. Galea with a long seta and a row of four short setae.

Abdominal segments 1–6 each with three dorsal annulets; each annulet with a transverse row of setae except the last annulet of segment 6. On the annulets of segments 1–5, each prescutum with six short setae, each scutum with three long setae and four short setae on each side, and each scutellum with 10 short setae. Abdominal segments 7 and 8 broad, each segment with two dorsal annulets and each annulet with a transverse row of setae. Segments 9 and 10 narrow, each with two transverse, closely placed rows of setae but dorsa not divided.

Raster with teges of 42–44 hamate setae scattered irregularly on the venter of 10th abdominal segment, three or four long and slender setae on each side. Lower anal lobe distinctly divided into two sublobes placed close to each other.

Ataenius sp. 4

Material examined: Ten third-stage larvae collected at Edgewater Golf Club, Chicago, Ill., Sept. 11, 1951, by A. M. Radke (USNM).

Description: Maximum width of head capsule of third-stage larva 1.29–1.32 mm. Cranium light yellow, surface smooth except for two depressions on each side on the frons. Three dorsoepicranial setae and two microsensillae on each side. Frontal sutures distinct. Clypeus divided into preclypeus and postclypeus.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 16 microsensillae; mesophoba polystichous. Crepide small and subcircular; epitorma asymmetrical, flattened apically and bent towards laeophoba.

Mandibles light yellowish brown with scissorial and molar area dark brown. Each mandible dorsally with two setae, ventrally with two setae. Brustia equally developed on both the mandibles.

Maxillary stridulatory area with an irregular row of 28–34 conical teeth facing cephalad; small toothlike markings behind the plectrum and on cardo. Galea ventrally with a long seta and a row of four short setae.

Abdominal segments 1–8 each with three dorsal annulets; each annulet with a transverse row of setae except the last annulet of segments 6–8. On the annulets of segments 1–5, each prescutum with six short setae, each scutum with four long setae and three short setae on each side, and each scutellum with 10 short setae. Abdominal segments 7 and 8 broad; 9 and 10 narrow, each with two transverse rows of closely placed setae but dorsa not divided.

Raster with teges of 42–49 hamate setae curved at their distal ends; two or three long and slender setae on each side. Lower anal lobe divided into two sublobes placed adjacent to each other.

Tribe Psammodiini

This tribe is represented in the United States by four of the 10 known genera—*Psammodius* Fallen, *Pleurophorus* Mulsant, *Trichiorhyssemus* Clouet, and *Rhyssemus* Mulsant.

Species dealt with in this study include *Psammodius oregonensis* Cartwright, *Psammodius hydropicus* Horn, *Pleurophorus caesus* (Creutzer) and *Pleurophorus longulus* Cartwright. Larvae of *Pleuro-*

phorus caesus (Creutzer), *Pleurophorus longulus* Cartwright, and *Psammodius hydropicus* Horn were obtained from the U.S. National Museum. Larvae of *Psammodius oregonensis* Cartwright were collected in the sand dunes at Waldport, Oreg.

Larvae of this tribe may be characterized as follows: Frons on each side with a single short posterior frontal seta and a microsensilla, a short anterior frontal seta and a microsensilla, a long exterior frontal seta and a microsensilla, and a long seta at each anterior angle. Scissorial area of left mandible with S_{1+2}, S_3, and S_4, of right mandible with S_{1+2} and S_{3+4}. Galea dorsally with three stout setae. Palpifer differentiated; stipes without stridulatory teeth.

Abdominal segments 1–5 each with three dorsal annulets; each annulet with a transverse row of setae. Segments 6–8 each with three transverse rows of setae but dorsa not divided. Segments 9 and 10 each with two transverse rows of setae, dorsa not divided. Lower anal lobe subdivided into two distinct sublobes.

Key to larvae of two genera of the tribe Psammodiini

Galea ventrally with a long seta and a row of three short setae; each abdominal spiracle-bearing area with 6–8 setae ventrally and two setae dorsally.
Psammodius Fallen

Galea ventrally with a long seta and two short setae; each abdominal spiracle-bearing area with two setae ventrally and one seta dorsally.
Pleurophorus Mulsant

Genus *Psammodius* Fallen

Larvae of this genus may be characterized as follows: Clypeus divided into smaller preclypeus and large postclypeus. First and third antennal segments subequal, second shorter than first and third. Epipharynx with dexiophoba and laeophoba monostichous; mesophoba incomplete in the middle and polystichous on the sides. Dexiotorma produced cephalad and caudad into an armlike structure; laeotorma small and slightly produced caudad with end blunt.

Galea ventrally with a long seta and a row of three short setae. Lacinia dorsally with a row of five long setae near the mesal edge and a short seta posteriorly. Each abdominal spiracle-bearing area with 6–8 setae ventrally and two setae dorsally. Lower anal lobe divided into two sublobes remote from each other.

Key to the known larvae of Psammodius

Frons without depressions; each antennal base with two long setae and two short setae exterolaterally; tibiotarsus nearly three times as long as wide.
oregonensis Cartwright

Frons with two depressions on each side; each antennal base with two long setae and one short seta exterolaterally; tibiotarsus nearly twice as long as wide.
hydropicus Horn

Psammodius oregonensis Cartwright

FIGURES 9, 37, 38, 50, 66, 72, 87

MATERIAL EXAMINED: Forty-four third-stage larva collected in sand dunes under grass roots at Waldport, Oreg. Four were collected on Jan. 29, 1955; 10 on Mar. 29, 1955; 20 on June 16, 1955; and 10 on Mar. 22, 1957.

DESCRIPTION: Maximum width of head capsule of third-stage larva 0.79–0.86 mm. Cranium whitish yellow, surface smooth. Five or six dorsoepicranial setae and two microsensillae on each side. Each antennal base with two long setae and two short setae exterolaterally and one long seta dorsally.

Epipharynx slightly broader than long. Protophoba bistichous on left and monostichous on right with 12–14 microsensillae. Crepide subcircular.

Dorsal annulets of abdominal segments 1–5 with setation as follows: each prescutum with eight short setae, each scutum with six long setae and 12 short setae on each side, and each scutellum with 12 short setae.

Raster with teges of 36–44 hamate setae scattered irregularly on the venter of 10th abdominal segment, five or six long slender setae on either side.

Psammodius hydropicus Horn

MATERIAL EXAMINED: One third-stage larva collected in field, with adults, at Folly Beach, S.C., June 14, 1941, by O. L. Cartwright (USNM).

DESCRIPTION: Maximum width of head capsule of third-stage larva 0.66 mm. Cranium light yellow, surface smooth except for two depressions on each side on the frons. Five or six dorsoepicranial setae and two microsensillae on each side. Each antennal base with two long setae and one short seta exterolaterally and one long seta dorsally.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 12 microsensillae.

Dorsal annulets of abdominal segments 1–5 with setation as follows; each prescutum with eight short setae, each scutum with five long setae and 11 short setae on each side, and each scutellum with 12 short setae. Raster with teges of 33 hamate setae curved at their distal ends.

Genus *Pleurophorus* Mulsant

Larvae of genus *Pleurophorus* may be characterized as follows: Each antennal base with two long setae and a short seta extero-

laterally and one long seta dorsally. Clypeus not distinctly divided into preclypeus and postclypeus. Lacinia dorsally with a row of four or five long setae near the mesal edge and one short seta posteriorly. Galea ventrally with a long seta and two short setae. Spiracular concavity facing ventrally. Each abdominal spiracle-bearing area with two setae ventrally and one seta dorsally. Lower anal lobe divided into two sublobes placed adjacent to each other.

Key to known larvae of *Pleurophorus*

Second and third antennal segments subequal, first long; laeotorma small as compared to dexiotorma in size; each mandible dorsally with a single seta.
caesus (Creutzer)

First and third antennal segments subequal, second short; laeotorma and dexiotorma more or less similar in size; each mandible dorsally with two setae.
longulus Cartwright

Pleurophorus caesus (Creutzer)

FIGURES 6, 22, 36, 64, 73, 89

MATERIAL EXAMINED: Two third-stage larvae collected at San Francisco, Calif., June 11, 1934, by P. C. Ting and J. B. Stinweden (POR); one third-stage larva, associated with two adults and a pupa, collected in potato hills at Wapota, Wash., July 14, 1941, by L. J. Lipovsky (USNM).

DESCRIPTION: Maximum width of head capsule of third-stage larva 0.79–0.81 mm. Cranium brownish yellow, surface smooth except for two depressions on each side on the frons. Four dorsoepicranial setae and one microsensilla on each side. Second and third antennal segments subequal, first longer than second or third.

Epipharynx with protophoba tristichous or bistichous on the left and monostichous on right; protophoba with 12–13 microsensillae. Crepide small, subcircular, and with two microsensillae. Tormae asymmetrical; dexiotorma produced cephalad and caudad; laeotorma smaller than dexiotorma.

Dorsal annulets of abdominal segments 1–5 with setation as follows: each prescutum with 10 short setae, each scutum with three long setae and nine short setae on each side, and each scutellum with 12 short setae.

Raster with teges of 28–31 hamate setae scattered irregularly on the venter of 10th abdominal segment, three or four long setae on either side.

Pleurophorus longulus Cartwright

FIGURES 21, 51, 65

MATERIAL EXAMINED: One third-stage larva associated with a pupa and adults, collected in soil samples from experimental plots at Gulf-

port, Miss., Jan. 14, 1943, by R. B. Swain (USNM); four third-stage larvae collected on dog fennel at Orville, Ala., May 12, 1943, by A. V. Smith (USNM).

Description: Maximum width of head capsule of third-stage larva 0.59–0.63 mm. Cranium light yellow, surface smooth. Three dorsoepicranial setae and two microsensillae on each side. First and third antennal segments subequal, second shorter than first and third.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 11–13 microsensillae. Crepide small, subcircular, with two microsensillae on it and two on either side of it. Epitorma asymmetrical, flattened apically and bent toward laeophoba. Tormae similar in size and shape, both tormae produced cephalad and caudad.

Dorsal annulets of abdominal segments 1–5 with setation as follows: each prescutum with six short setae, each scutum with three long setae and four short setae on each side, and each scutellum with eight short setae.

Raster with teges of 18–22 hamate setae scattered irregularly on the venter of 10th abdominal segment, setae curved at their distal ends.

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Symbols on Figures 1–89

A—Antenna
AA—Seta of anterior frontal angle
AC—Acia
ACP—Acanthoparia
ACR—Acroparia
AFS—Anterior frontal seta
BR—Brustia
CAR—Cardo
CL—Claw
CLP—Clypeus
COX—Coxa
CR—Crepis
DES—Dorsoepicranial setae
DPH—Dexiophoba
DX—Dexiotorma
EFS—Exterior frontal setae
ET—Epitorma
FEM—Femur
FS—Frontal suture
G—Galea
GL—Glossa
GP—Gymnoparia
H—Hyptomerum
L—Labium
LA—Lacinia
LAL—Lower anal lobe
LP—Labial palpus
LPH—Laeophoba
LT—Laeotorma
M—Molar area
MP—Maxillary palpus
MPH—Mesophoba
MS—Macrosensilla
O—Oncylus
PC—Preclypeus
PF—Palpifer
PFS—Posterior frontal seta
PLA—Pladium
PPH—Protophoba
PSC—Postclypeus
S1–4—Scissorial teeth
SE—Sensory organ
SP—Sensory pegs
SPR—Spiracle
ST—Maxillary stridulatory area
3SEG—Third segment
T—Teges
TRO—Trochanter
TTS—Tibiotarsus
UAL—Upper anal lobe

EXPLANATION OF FIGURES

FIGURES 1–11.—Heads: 1, *Ataenius saxatilis* Cartwright; 2, *Aegialia blanchardi* Horn; 3, *Aphodius erraticus* (Linnaeus); 4, *Euparia castanea* Serville; 5, *Aphodius fimetarius* (Linnaeus); 6, *Pleurophorus caesus* (Creutzer); 7, *Saprosites pygmaeus* Harold; 8, *Ataenius* sp. (*strigatus* group); 9, *Psammodius oregonensis* Cartwright; 10, *Oxyomus silvestris* (Scopoli); 11, *Aphotaenius carolinus* (Van Dyke).

FIGURES 12–31.—12–15, Third and fourth antennal segments: 12, *Aphodius granarius* (Linnaeus); 13, *Oxyomus silvestris* (Scopoli); 14, *Aphodius fimetarius* (Linnaeus); 15, *A. troglodytes* Hubbard. 16–22, 27, Antenna: 16, *Aphodius fossor* (Linnaeus); 17, same, distal portion; 18, *Aphotaenius carolinus* (Van Dyke); 19, *Ataenius saxatilis* Cartwright, distal portion; 20, *Euparia castanea* Serville; 21, *Pleurophorus longulus* Cartwright; 22, *P. caesus* (Creutzer); 27, *Ataenius saxatilis* Cartwright. 23–26, 28–30, Dorsal view of left mandible: 23, *Aphodius granarius* (Linnaeus); 24, *Euparia castanea* Serville; 25, *Aegialia lacustris* LeConte; 26, *Oxyomus silvestris* (Scopoli); 28, *Aphodius fimetarius* (Linnaeus); 29, *A. erraticus* (Linnaeus); 30, *A. sparsus* LeConte. 31, *Euparia castanea* Serville, dorsal view of right mandible.

FIGURES 32–46.—32–37, Left mandible (all views dorsal except 35): 32, *Ataenius saxatilis* Cartwright; 33, *Ataenius* sp. (*strigatus* group); 34, *Aphotaenius carolinus* (Van Dyke); 35, same, ventral view; 36, *Pleurophorus caesus* (Creutzer); 37, *Psammodius oregonensis* Cartwright. 38, Same, right mandible, dorsal view. 39, 40, Left maxilla, labium, and hypopharynx, dorsal view: 39, *Aegialia blanchardi* Horn; 40, *Oxyomus silvestris* (Scopoli). 41, *Aphodius erraticus* (Linnaeus), left maxilla, dorsal view. 42,43, *A. fimetarius* (Linnaeus), dorsal views: 42, left maxilla; 43, labium and hypopharynx. 44,45, *Euparia castanea* Serville, dorsal views: 44, left maxilla; 45, labium and hypopharynx. 46, *Saprosites pygmaeus* Harold, left maxilla, labium, and hypopharynx, dorsal view.

FIGURES 47–56.—47,48, Left maxilla, labium and hypopharynx, dorsal view: 47, *Aphotaenius carolinus* (Van Dyke); 48, *Ataenius saxatilis* Cartwright. 49, *A. ovatulus* Horn, left maxilla, dorsal view. 50, *Psammodius oregonensis* Cartwright, left maxilla, labium, and hypopharynx, dorsal view. 51, *Pleurophorus longulus* Cartwright, left maxilla, dorsal view. 52–56, Epipharynx: 52, *Aphodius fimetarius* (Linnaeus); 53, *Aegialia blanchardi* Horn; 54, *Aphodius stercorosus* Melsheimer; 55, *Aphodius haemorrhoidalis* (Linnaeus); 56, *A. sparsus* LeConte.

FIGURES 57–66.—Epipharynx: 57, *Aphotaenius carolinus* (Van Dyke); 58, *Ataenius saxatilis* Cartwright; 59, *Ataenius* sp. (*strigatus* group); 60, *Oxyomus silvestris* (Scopoli); 61, *Euparia castanea* Serville; 62, *Saprosites pygmaeus* Harold; 63, *Aphodius lividus* (Olivier); 64, *Pleurophorus caesus* (Creutzer); 65, *P. longulus* Cartwright; 66, *Psammodius oregonensis* Cartwright.

FIGURES 67–78.—Venter of 10th abdominal segment: 67, *Aphodius prodromus* Brahm; 68, *Saprosites pygmaeus* Harold; 69, *Aphodius pardalis* LeConte; 70, *Aegialia blanchardi* Horn; 71, *Oxyomus silvestris* (Scopoli); 72, *Psammodius oregonensis* Cartwright; 73, *Pleurophorus caesus* (Creutzer); 74, *Aphotaenius carolinus* (Van Dyke); 75, *Ataenius* sp. (*strigatus* group); 76, *Aphodius fimetarius* Linnaeus; 77, *A. vittatus* Say; 78, *Ataenius saxatilis* Cartwright.

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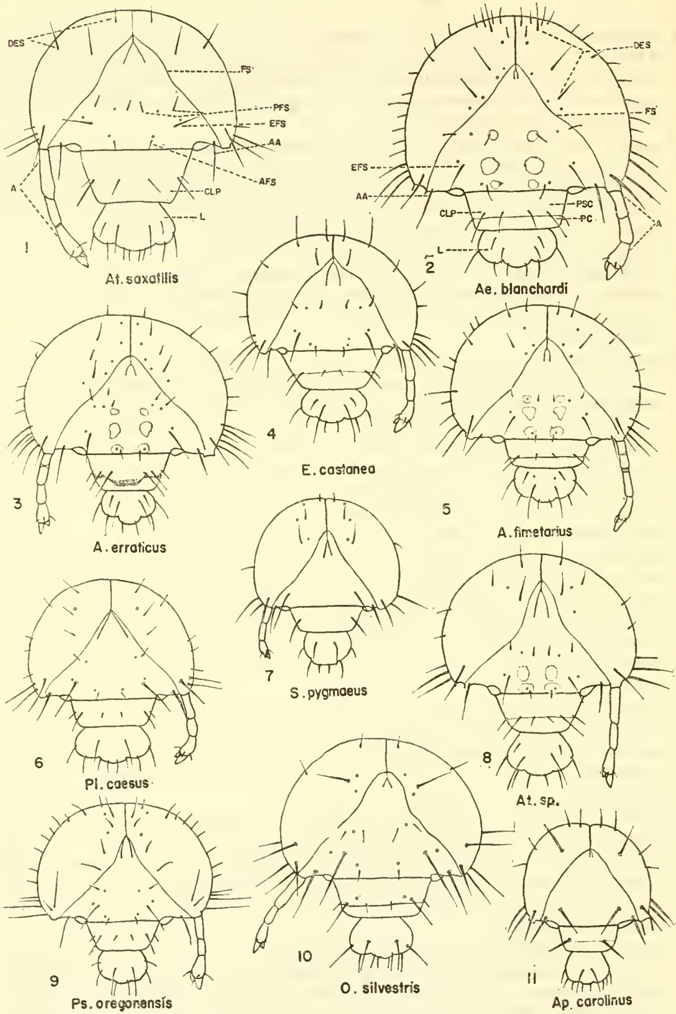
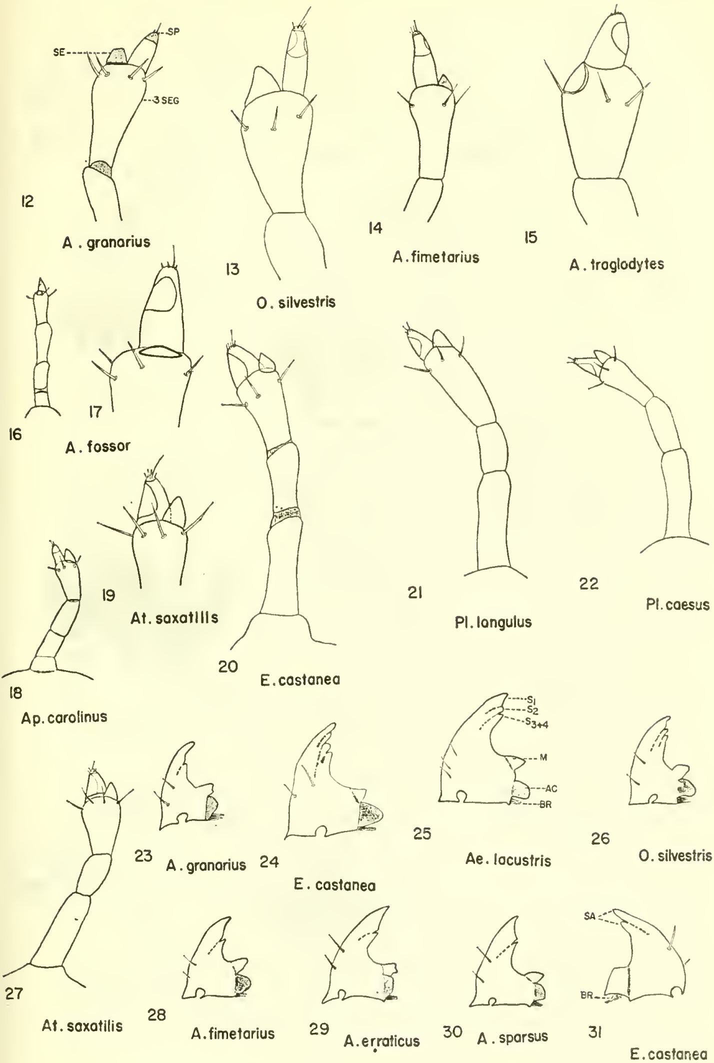


Figures 1–11.—Explanation on page 87.



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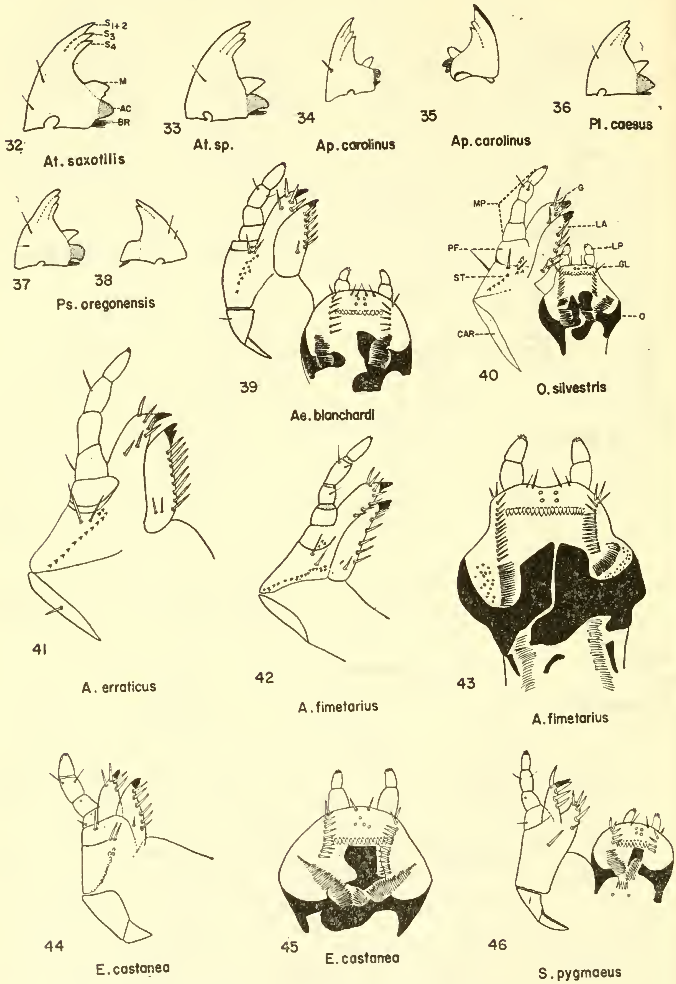

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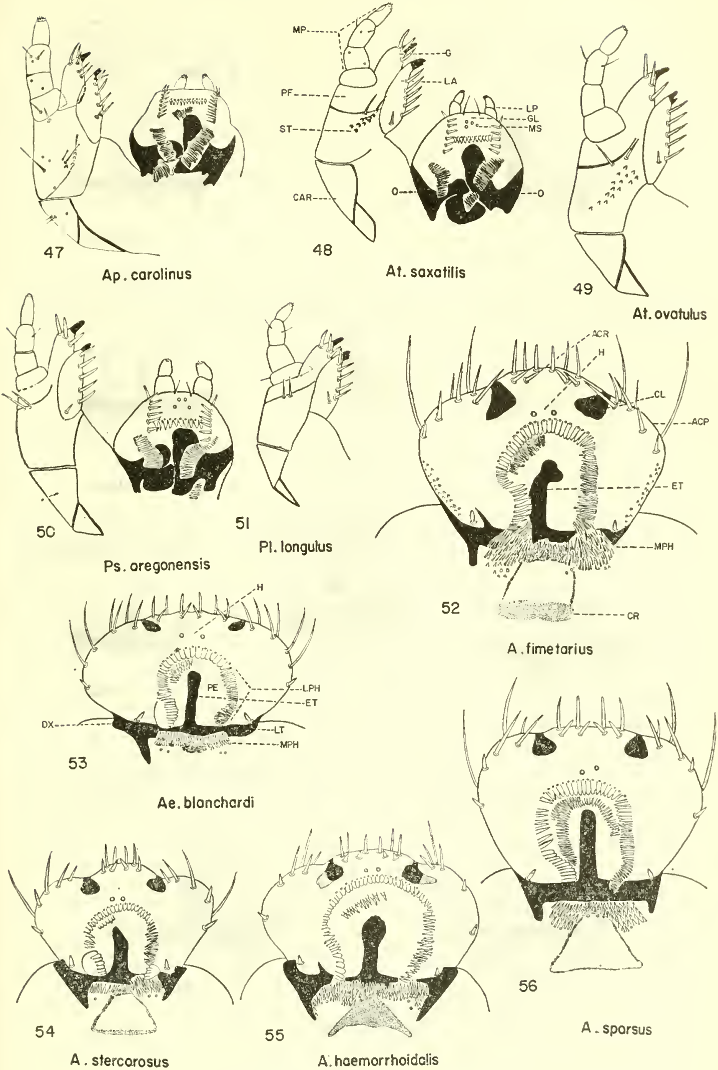

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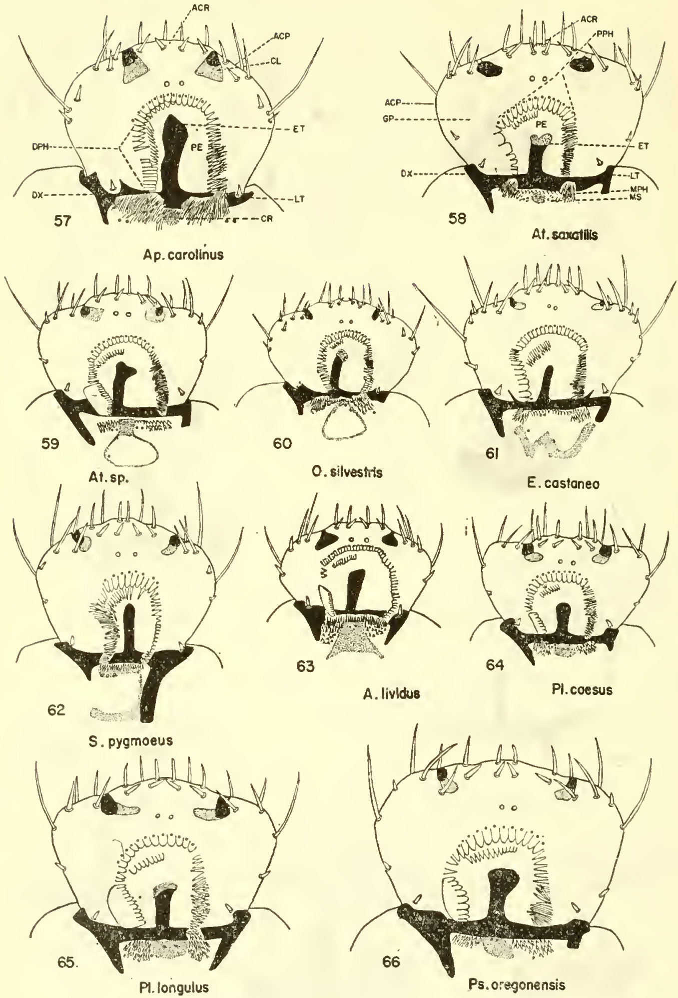

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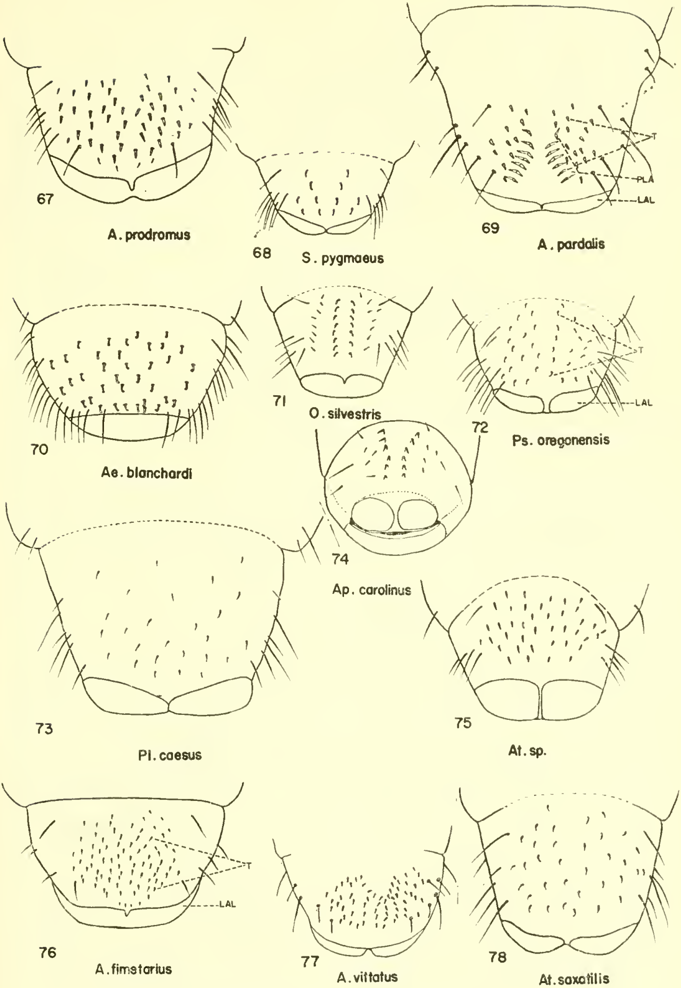

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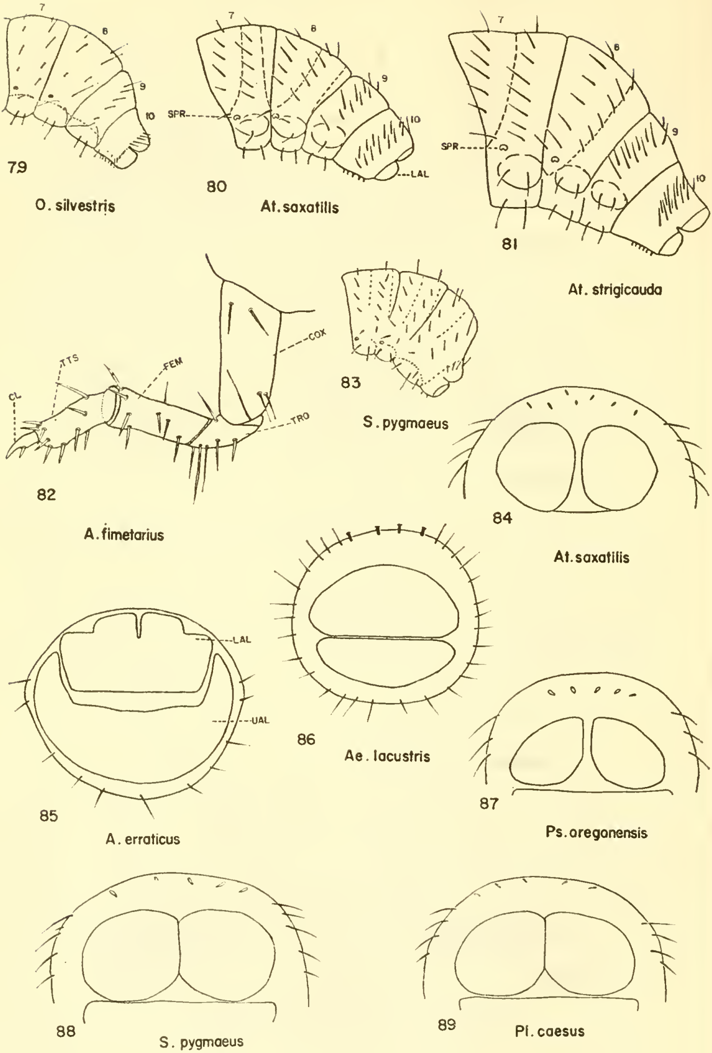

Figures 79–89.—Explanation on page 87.

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A SYNOPSIS OF THE ATOPETHOLIDAE, A FAMILY OF SPIROBOLOID MILLIPEDS

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Introduction

The Sonoran region of Mexico and southwestern United States is inhabited by species of the milliped family Atopetholidae, a small group of the order Spirobolida apparently endemic to North America. Despite its relatively limited extent, the family has fallen over the years into a state of progressively increasing confusion, which seems to be the normal course of events in this class of arthropods. Since the family Atopetholidae was defined in 1918, some of its genera have frequently been listed in the Spirobolidae (a completely dissimilar family), while perfectly typical genera of the latter group have simultaneously been considered atopetholids. No serious attempt has been made to study the male gonopods of any atopetholid species; hence the systematic position of the family has never been established. Still worse, several genera were so poorly proposed that they have remained unidentifiable up to the present time, and have provoked considerable confusion and synonymy. The value of the various taxonomic characters normally used has never been critically considered.

At this time a complete and satisfactory revision of the family Atopetholidae cannot be undertaken. Many of the species are known

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only from type specimens which are now lost or otherwise inaccessible. Obviously, a large number of species and probably additional genera remain to be discovered and integrated into the existing system, which thus stands vulnerable to future modification and expansion. The geographic range of no single species can presently be mapped with any sort of precision.

These facts might suggest that the present synopsis is founded upon an undue measure of presumption. Actually, there is every justification for immediate attention to whatever problems can be solved or even defined with the material at hand, for it is essential that the confusion be resolved and the classification stabilized as soon as possible before additional knowledge is superimposed on the currently shaky framework.

In this paper we have endeavored to phrase some tangible definitions for the family as well as for subfamily and generic categories, to clarify gonopod structure and thus establish a basis for future studies of comparative morphology, and to evaluate some of the structural variables which have been used to recognize species. Where material has permitted, we have redescribed both species and genera in detail, and have emphasized some characters normally overlooked. The level of thoroughness of this phase is noticeably uneven, for, lacking specimens, almost nothing could be done with the subfamily Atopetholinae. Nonetheless, this paper lays some claim to distinction in being the only one of its kind yet essayed for a family of millipeds.[3] We trust that our paper will be useful to those interested in describing and collating our native milliped fauna, one of the most diverse in the world, and will constitute a first step toward an eventual monograph of the great order Spirobolida.

Materials and Acknowledgments

Although the quantity of specimens that we have examined is not great, it nonetheless is quite diverse and gives a fair cross section of the family. We have studied 9 species representing 7 of the 11 known genera and all of the 4 subfamilies here recognized, and as a result have been able to utilize accounts in the literature of other genera with some degree of confidence. The validity of specific concepts has been enhanced by the abundance of typical material, one of the species being represented by a topotype, three others by paratypes, and two more—here described as new—by the holotypes. All of these type specimens as well as material of the other species are in the collection of the U.S. National Museum.

[3] A detailed study of the family Spirobolidae, by Dr. William T. Keeton, is now being prepared for publication.

We wish to acknowledge the cooperation in the loan of material by Dr. H. W. Levi of the Museum of Comparative Zoology and by H. S. Dybas and R. L. Wenzel of the Chicago Natural History Museum. Dr. Ralph Crabill deserves our thanks for the loan of paratypes from the U.S. National Museum and for the gift of atopetholids that previously came into his hands. Dr. R. V. Chamberlin very kindly examined some type specimens in his collection in response to several appeals for information on structural details. Our colleague H. F. Loomis, the describer of several atopetholids, kindly gave valuable comparative material and advice concerning some phases of the project. Finally, that the subfamily Eurelinae is now the best known atopetholid group is attributable to the interest and cooperation of Leslie Hubricht, whose collections provided the initial stimulus for undertaking the project.

Review of the Literature

Apparently the first member of the Atopetholidae to be described was the small Mexican species named *Iulus nietanus* by Saussure in 1860. Owing to a lack of information on its sexual characters, this species was subsequently placed first in the genus *Spirobolus*, then into *Cyclothyrophorus*, and finally, after a study of the type specimens, was made the type of the genus *Saussurobolus* by Carl in 1919.

The first generic name based upon an atopetholid is *Onychelus* Cook, proposed in 1904 for a small spiroboloid from southern California. Cook included *Onychelus* in the Spirobolidae, which he considered at that time to be the only family in the order Spirobolida. The description of the genus and its type species, *O. obustus*, was fairly detailed, but most unfortunately lacked illustrations and presented a very vague description of the gonopods, conditions that subsequently gave rise to considerable confusion. In a later paper (1911), Cook described several additional genera and species, including *Eurelus soleatus*, *Centrelus falcatus*, *Onychelus dentatus*, *O. hospes*, and *O. suturatus*, the last three being species of the genus now known as *Arinolus*. In this paper Cook also neglected to provide illustrations of the genitalia, and considerable synonymy has resulted from subsequent inability to recognize his species with any degree of certainty. One generic and two specific names must now be rejected as junior synonyms because of the shortcomings of Cook's work, although the verbal descriptions of body form are as detailed and accurate as one might wish.

The family Atopetholidae was erected in 1918 by R.V. Chamberlin to include the new genera *Atopetholus* and *Hesperolus*, and also "*Onychelus*, *Eurelus*, and related genera of the southwestern United States and Mexico." In defining the family limits, Chamberlin relied

chiefly upon the characters of the typical genus, and some of the original criteria must now be modified or restricted. However, at least one statement still holds true for the family as now known: "Posterior gonopods with telopodite simple and mostly bladelike with no separate inner piece; basal region often more or less extended mesad at an angle suggestive of condition in the Trigoniulidae." It was also remarked that the shape of the collum distinguishes atopetholids from the true Spirobolidae of North America, but this character is not exclusive to the Atopetholidae. Most regrettably, the paper contained no figures of the gonopods, the reason being given that "Preliminary accounts of these and three other new forms . . . are given below in order that the names may be validated for early use." But nearly 40 years passed before any of the species were ever mentioned again, even nominally, in the literature.

In the following year (1919) appeared a paper by Johann Carl, redescribing some of the type specimens of Saussurean species, which were still unknown with respect to their important characters. Carl, who found that actually two species had been originally included in *Julus nietanus*, described the second species under the name *neglectus*, and proposed the new genus *Saussurobolus* for the two. He also presented clear and useful illustrations. He remarked on the similarity of the gonopods to those of typical trigoniulids, a comment that influenced most of his successors.

A few years later Chamberlin described two additional atopetholids, *Atopetholus angelus* in 1920 and *Onychelus nigrescens* in 1923. The latter species was illustrated, and the figures give a fair impression of the gonopod characters.

By 1926, the family was still virtually unknown, as it was then impossible to associate *Saussurobolus* with the typical genus; it is small wonder that Attems could only note the existence of the name Atopetholidae, with its originally included genera, in the "Handbuch der Zoologie." Following the statement by Carl, Attems placed *Saussurobolus* in the family Trigoniulidae, where it has remained to this day.

With the description of *Piedolus utus* by Chamberlin in 1930, another form was added to the atopetholid roster, but unfortunately this name fell into obscurity and was not mentioned in several subsequent lists of genera until its inclusion in the checklist of Chamberlin and Hoffman in 1958. Subsequent to *Piedolus*, no other atopetholids were described until 1938, when Karl W. Verhoeff, publishing on material received from southern California, named *Onychelus michelbacheri* as a new species, erected a family Onychelidae on the basis of the single form, and stated that the name Atopetholidae was a nomen nudum. He obviously had not seen Chamberlin's 1918 paper.

Since 1940 a steady flow of publications has swollen the ranks of the family. Most of these papers have been concerned solely with the description of new species and genera, and need not be summarized in detail. It may be added, however, that no consistency has been obtained as regards the systematic position of many genera. In a contribution appearing in 1941, Chamberlin (1941a) included the genera *Hiltonius* and *Messicobolus* in the Atopetholidae although both belong elsewhere. In the previous year, the new genus *Arinolus* had been compared in the generic diagnosis only with *Tylobolus*, *Hiltonius*, and *Spirobolus*, of which all belong to the Spirobolidae. In 1943, he (1943a) treated five genera as atopetholids—*Hiltonius*, *Tarascolus*, *Toltecolus*, *Messicobolus*, and *Aztecolus*—and of these only the second and third actually belong to the family.

In 1949, a short paper by Dr. Chamberlin reviewing the genera of both families restated the main differences between the two and corrected the previous erroneous allocations. Yet, even in this work, with three new atopetholid generic names proposed, the established genera *Arinolus* and *Piedolus* were completely omitted.

The recently published "Checklist of the Millipeds of North America" (Chamberlin and Hoffman, 1958) lists all the known genera and species occurring within the United States, but, being largely a compilation from the literature, it perpetuates a number of errors, which we discuss fully in the following systematic account. We earnestly hope that with the publication of the present work, the misunderstood and abused Atopetholidae will at last become an intelligible group upon which future systematic work can be based with a considerable degree of confidence. This synopsis claims only to be the rough foundation upon which a handsome systematic edifice may someday be erected.

Taxonomic Characters

In preparing descriptions, we have devoted attention to all of the structural features of atopetholids hitherto utilized for diagnostic purposes, as well as to numerous others that were entirely neglected in the general preoccupation with those characters easiest to observe and mention. Many characters in this last category have been found worthless for taxonomic purposes. An attempt to study variation, whenever adequate series permitted, has been moderately successful. We have also determined that it is possible in many cases to identify female specimens at least to genus, although our knowledge of the family is still too meager to warrant the description of new species from female specimens. When sufficient material has accumulated to permit careful revision of genera and actual comparison of known females is possible, it seems quite likely that determinations can be

made on specimens of either sex by the use of qualitative external characters as pronounced as those utilized to distinguish species in Coleoptera, Orthoptera, and other insect groups.

Cranium: In nearly all of the species examined, the head is completely smooth and polished except for the normally concealed surface of the vertex, which tends to be finely rugose. The eurelines, however, often develop faint sculpture on the lower part of the head, the sculpture being well developed as genal striation in *Centrelus* and thus providing a means for distinguishing this genus from the closely related *Eurelus*.

Clypeal foveolae: In all the species of the family, the total range of variation in this character is from 3–3 to 5–5, and this range may be observed in a single species. There is no defensible reason for the erection of species upon slight variation in this character. In nearly every case, comparison was made between a single specimen of an allegedly new species with a single specimen of another. The tacit assumption that the clypeal foveolae do not vary within a species indicates nothing more than unfamiliarity with the group.

Ocelli: In a general way, the number of ocelli tends to be characteristic of the subfamilies although there is some overlap. Species of the Eurelinae usually have 40 to 50 in each ocellarium (a new term to replace the incorrect "eye" and the awkward "ocellus patch"), and those of the Arinolinae have from 30 to 40, but the variation in a single species is usually as great as for the entire subfamily. We have detected no significant variation in size, shape, or arrangement of the ocelli in species or genera. As a rule, the ocelli are difficult to count with accuracy. We have found that the only way to be absolutely sure of the number is to boil the cranium in strong KOH or NaOH until the exoskeleton is rendered colorless and the ocelli become very sharply defined. As a rule, the smaller species have smaller ocellaria, which are correspondingly more widely separated, and it may be entirely possible to take accurate measurements and work out ratios that would be of diagnostic importance. Such refinements, it seems, may profitably be postponed until an adequate volume of material is available for analysis.

Antennae: The antennal articles are generally similar in size, proportion, and vestiture throughout the family, with the second normally the largest, followed by the sixth, third, fourth, fifth, seventh, and first. In the Eurelinae the antennae are shortest in proportion to the size of the animal, and usually do not reach beyond the caudal edge of the collum when straightened and extended caudad. The smaller species, such as those of *Arinolus* and *Onychelus*, have much longer antennae; these extend back to the third segment, and the individual articles are much longer in proportion to their width. The

second article in such forms usually extends distad beyond the rounded apex of the genae. There seems to be no significant variation with respect to the size and distribution of setae and pubescence on the antennae, and all known species have four terminal sensory cones. No other sensory structures or areas have been detected.

MANDIBLES: The basal joint of the mandibles is somewhat enlarged on the outer surface and appears elongated in the dorsoventral direction; the collum is correspondingly cut away on the anterior edge to accommodate this convexity. There is therefore no provision for an antennal groove such as occurs in the Spirobolidae, the antennae being held instead in a shallow depression on the outer face of the stipital joint of the mandible. This surface may be either smooth or moderately transversely striate and may be shown by future studies to be useful in the recognition of species, although the surface seems to vary within the limits of a genus. The free ventral edge may or may not be set off by a fine marginal ridge.

GNATHOCHILARIUM: The appearance of the gnathochilarium is essentially the same in all genera of the family and seems not to differ from that in most spiroboloid families. It may be noted in passing, however, that the base of the mentum is produced on each side into a distinct lobe possibly homologous to the cardine, which is said by Attems to be missing in the Spirobolida. This development is readily seen in *Eurelus soleatus* (see fig. 1,*a*).

HYPOPHARYNX: The shape of the hypopharynx was not investigated by previous workers for its possible utility in classification. In the belief that some differences may exist in the structure at least at the family level, we introduce a drawing (fig. 1,*b*) of the hypopharynx in *Eurelus soleatus* for comparison with species in other families.

COLLUM: In general appearance the collum is similar in all members of the family in being smooth, evenly acuminate laterad, and with the anterior margin excavated, but there is considerable minor variation reflecting specific differentiation. Particular reference is made to the shape of the lateral ends of the collum, and the submarginal anterior groove on each side. In *Centrelus kerrensis* (fig. 5,*c*), for instance, the groove is very deep and distinct and sets off the edge as a sort of swollen ridge, which is extended ventrad into a rounded projection more pronounced than in any other atopetholid. In *Arinolus torynophor* (fig. 10,*b*) the caudal edge is somewhat concave just before the end so that the extreme tip seems to be produced caudoventrad, a peculiarity not observed in *A. apachellus* or *A. citrinus*. In species of *Watichelus* the condition is even more accentuated and thus provides a means of separating them from the closely related species of *Atopetholus*. In some forms the submarginal groove is nearly parallel to the anterior edge; in others (fig. 7,*d*) the groove becomes more remote

in going upward. The extreme lateral ends may be turned outward, as for instance in *Scobinomus*, and are readily visible from above.

Body segments: A close scrutiny of the body segments in our material has revealed some interesting information of a broad morphological nature. It seems pertinent to preface a consideration of segmental sculpture with some remarks on the composition of segments in the Spirobolida.

For many years the segments of spiroboloid millipeds were generally considered to be composed of a sternite and a completely coalesced

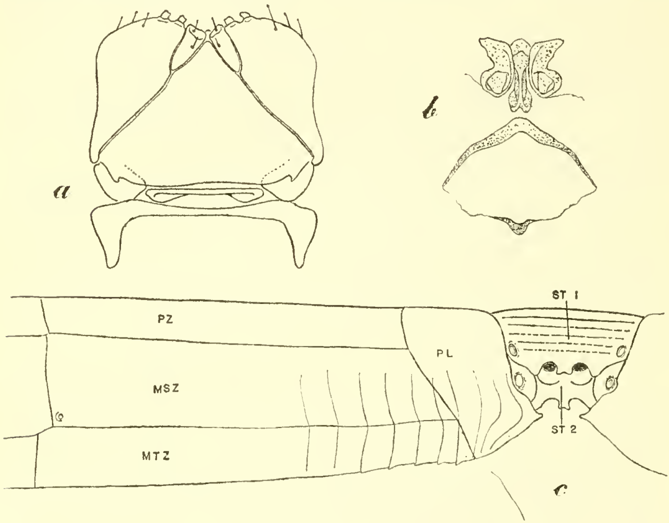

Figure 1.—Structural details of *Eurelus soleatus: a*, Gnathochilarium; *b*, hypopharynx; *c*, semidiagrammatic sketch of a midbody segment showing the two fused sternites, and the pleurite and lower tergal elements of the left side. Abbreviations; PL, pleurite: PZ, prozonite; MSZ, mesozonite; MTZ, metazonite; ST 1, anterior sternite; ST 2, posterior sternite.

"pleurotergite" often divided by a transverse suture into a prozonite and a metazonite, the latter occasionally with a faintly defined longitudinal suture behind the ozopore. In numerous publications by two such celebrated authorities as Attems and Verhoeff, suprageneric groupings were often based on the location of the pore in front of or behind the transverse suture. That the traditional dichotomy of "prozonite" and "metazonite" is untenable was first established by Cook (1896), who discovered that the spiroboloid segment is composed of a double sternite, a distinct pleurite on each side, and a dorsal

tergite subdivided into 12 smaller sclerites in 3 transverse series of 4 each.

Cook's observations were made upon specimens of *Pachybolus*, an African genus belonging to the same suborder as the Atopetholidae, and a newly moulted specimen of *Narceus*, a genus of the suborder Spirobolidea. We can confirm his account with the notice of identical segmentation in a newly moulted specimen of *Eurhinocricus* (Rhinocricidae) from Jamaica, and in several adult and hardened specimens of *Arinolus* and *Centrelus* in the Atopetholidae. In brief, there is a small elongate pleurite on each side, slightly narrower than the sternite, above which the tergite is divided into three transverse belts by two sutures. There is furthermore a median dorsal suture across all three transverse belts, and one such suture on each side at the level of the pores. If the familiar usage of prozonite and metazonite is to be preserved, it must be corrected and amended by the addition of the intermediate belt, which can be designated as the mesozonite (new term). It will now be into the mesozonite that the pore opens when it is in front of the second suture, not into the prozonite. A diagram (fig. 1,*c*) is provided to indicate segmental composition, which is shown as a flattened strip with the segment broken on one side at the pleurosternal suture.

In the Trigoniulidea, apparently the more primitive of the two suborders on the basis of this segmental composition as well as gonopod characters, much of the subsegmentation is visible in normal adult specimens, particularly in *Centrelus* and in *Arinolus*. In the more specialized Spirobolidae, the sutures are obliterated in adults, and evident only in specimens not completely calcified. The presence in spiroboloids of a distinct middorsal suture is a corroboration of the primitive nature of the order as already indicated by the retention of posterior gonopods and the presence of an eversible "penis" terminating the vasa deferentia.

Typically the surface of the pleurotergites is smooth and polished, usually with a scattering of very fine punctations. In some forms, such as the species of *Onychelus* and *Arinolus*, the surface of the metazonites is somewhat inflated and raised above the preceding subsegment, and may differ from it in microsculpture. In most cases the prozonite is provided with a number of fine encircling striae, as is normal for spiroboloids. The lower ends of both prozonites and metazonites, and often also the pleurites, are ornamented with a very fine reticulum of beaded striae enclosing polygonal areas that become elongated higher up on the sides and gradually merge into the transverse striae. In nearly all forms the lower sides of the metazonites are provided with short longitudinal striae or the ventral edges of impressed grooves; in several species these elevated areas

are strongly developed and may be carried out beyond the caudal edge of the metazonite in the form of acute, upturned spinules. Whether such modification is generic or only specific in value remains to be determined; it recurs in various other spiroboloid families in Central America and elsewhere.

With few exceptions, the ozopores open just in front of the second segmental suture, and slightly below the level of the lateral longitudinal suture. Species of the subfamily Arinolinae, so far as is known, differ in that the pore is on the caudal side of the suture and thus opens in the metazonite. This modification is almost certainly an evolutionary specialization, as it seems to occur only in forms that are specialized in other respects as well.

Male gonopods: The conformation of the male genitalia is basically uniform in most of the genera. Most diagnostic for the family are the combined features of a small transverse sternite and elongated coxal apodemes of the anterior gonopods, and the somewhat diminutive, two-jointed posterior gonopods. On the basis of the material studied in this as well as other spiroboloid families, the musculature of the gonopods appears also to be characteristic of the group.

Details of the sclerotized parts of the gonopods can be appreciated only from material that has been cleaned of muscle tissue after removal from the body of the specimen. Strong caustic solutions, with heating, quickly macerate the tissue, which then can be picked off with fine-tipped forceps. The importance of examining the gonopods in this way cannot be overemphasized.

The sternite of the anterior gonopods is represented in all the genera, usually as a narrow, subtransverse sclerite that is more or less arched at the middle, presumably to facilitate passage of the coelomic cavity. At the lateral ends the sternite is produced proximally into elongate sternal apodemes, the homologs of the functional tracheal apodemes of the typical generalized diplopod sternite. The gonopod apodemes, however, are closed tubes, and function only for muscle attachment; they tend to be short and slender, normally curving slightly mesiad. Beyond the origin of the apodemes, the sternite is curved caudolaterad around the base of the coxite and is usually coalescent with it. In *Comanchelus hubrichti* (fig. 6,*b*) this fusion is incomplete; the tip of the sternal extension remains free of the coxite margin, probably reflecting a primitive condition.

In general, the coxites are firmly attached to the lateral extremity of the sternite, leaving a more or less membranous, unconsolidated area along the middle of the gonopod. This condition is characteristic of the subfamily Eurelinae, where a distinct intercalary thickening of the membrane between the coxites has taken place—a development here referred to as the vinculum (Lat., a buckle)—and clearly

serves the function of providing rigidity to the entire structure. Species of the Atopetholinae have increased the size and efficiency of the vinculum, which takes up much of the intercoxal space, and is prolonged caudad between the coxites, terminating in a ligament that extends laterad on each side to insert on the caudad side of the sternal apodeme (fig. 2,*c*, No. 5). The greatest development of the sternite is found in the subfamily Onychelinae, where it is prolonged distad into a triangular process very similar to the sternite of species of the Rhinocricidae (see fig. 8,*a*). Here there is no spacer between the coxites, rigidity of form apparently being accomplished by a certain amount of fusion of coxites to the sternite.

The coxites are somewhat variable in form throughout the group, but are similar to the typical spiroboloid form in being produced into a slight apex on the mesial surface, this character reaching its greatest extreme in *Arinolus* (fig. 11,*a*), which is apparently the most specialized genus in the family. In all genera, the coxites are produced proximad into slender, acute coxal apodemes that serve for muscle attachment. As seen in caudal aspect (figs. 2,*a*; 4,*b*; 8,*b*), the mesial edge of the coxite is drawn out gradually to form the apodeme, which may be either flat and simple (fig. 8,*b*) or rolled to form a concavity (fig. 4,*b*) with the free caudal edge joining the coxite near its caudomesial end. In all cases, the coxite forms a gonocoel cavity in which the posterior gonopod is carried.

The telopodite joint is normally rather small and unmodified. Usually it is produced into a blunt, laterally directed tip, with a departure from this plan occurring only in *Atopetholus*. Species of that genus are characterized by an additional accessory process that has been referred to in the literature as "posterior apophysis," "digitiform process," and "posterior finger" by Chamberlin and that appears to be possibly homologous to similar processes described by Verhoeff (1924) for some Australian spirobolellid genera. There is a membranous, flexible articulation between the coxite and telopodite, but within the gonopod no major muscles have been detected that might activate the distal joint. Apparently there is an evolutionary tendency for the size of the telopodite to increase, it being smallest in *Comanchelus* and largest in *Arinolus*, genera that are phylogenetically opposed in numerous other characters as well.

The posterior gonopods lie concealed within the anterior pair, their coxites exposed and directed toward the median line, often with their ends in contact. There is, however, no trace of a sternal connection, and it will be recalled that in the Trigoniulidae, where such a sternite persists, the coxites are directed caudad in line with the major body axis. There is a large apodeme, inferentially homologous with the sternal apodeme of the anterior gonopods, attached near the mesial

end of each gonopod by a loose, flexible pivot joint. The shape of the apodeme varies somewhat, it being long and slender in the larger bodied, primitive forms (Eurelinae, Atopetholinae), and becoming shorter in the smaller forms, where it may also (as in Onychelinae) be distally expanded. The relatively larger size of the posterior gonopod in this subfamily presumably requires, within the confines of a smaller available space, a greater surface for attachment of the muscles. In two of the subfamilies, Eurelinae and Atopetholinae, the distal joint of the posterior gonopod is undifferentiated; there is no perceptable articulation between, or remaining evidence of, coxal and postcoxal elements. That the gonopod is actually 2-jointed, however, is shown in the Onychelinae and Arinolinae, where an acute angle is formed, with a flexible articulation at the apex (figs. 8,*c*–*e*; 10,*c*). In no case, however, are there remnants of intersegmental muscles in the posterior gonopods of atopetholids or any other group known to us. It is curious that this primitive leg condition would be preserved in members of what, in all other respects, are specialized atopetholids, and emphasizes the point that no existing spiroboloid species has retained ancestral characters in all of its structural features, the parts apparently evolving at different rates and somewhat independently of each other in this respect.

In general appearance the posterior gonopod is short and bent somewhat mesiad. In the Eurelinae it tends to develop a large hyaline flange on the median side, as in *Comanchelus hubrichti* (fig. 6,*c*). In the Atopetholinae this gonopod is longer, more slender, and somewhat arcuate, with a thin expansion on the caudal edge in *Atopetholus* and a distinct projecting branch there in *Watichelus*. In the Arinolinae there is a distinct submarginal groove from the coxal attachment distad to a short solenomerite (*Arinolus*, fig. 10,*d*) or a longer one which actually extends distad beyond the tip of the gonopod (*Piedolus*). In this subfamily, also, the gonopod terminates in an expanded, laminate or subglobose area (figs. 10,*a*,*c*; 11,*c*) which is herein tentatively referred to as the calyx. The occurrence of the groove, presumably homologous to the seminal groove of many other diplopods, is obviously an evolutionary specialty not found in the other three subfamilies.

Gonopod musculature: It is felt that a satisfactory concept of phylogeny and classification of the Spirobolida can be achieved only by a detailed consideration of comparative morphology of the various groups. Studies of the hard parts are undoubtedly a step in the right direction, but lack real significance until the physiological functions of the various modifications are established. These functions are to a certain extent reflected by the nature of the musculature, and as a contribution toward this end we include a brief account of the gonopod muscles in *Atopetholus angelus*, a species of the typical genus of the

family. Unfortunately, none of the available material of the other species was preserved in a way to keep the internal tissues in good condition, but in the Eurelinae, at least, the gonopod muscles appear to be much the same as here described. The similarity in skeletal parts of the other groups permits the inference of essential muscular correspondence. The only previous notice of musculature in an atopetholid is in the paper on *Atopetholus michelbacheri* by Verhoeff (1938), but his drawings are so diagrammatic and vague as to be totally useless. In the absence of detailed studies on species in other families, and in anticipation of much variation in arrangement, we refrain from submitting any tentative nomenclature at this time and use a numerical symbolism in designating the different muscles and describing their functions.

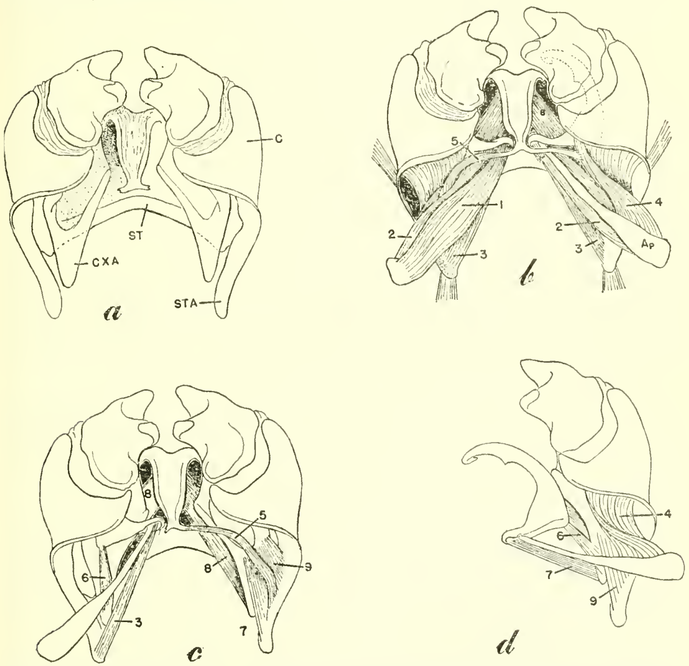

FIGURE 2.—Male gonopods of *Atopetholus angelus* in caudal aspect: *a*, anterior gonopods with all muscle tissue removed to show internal structure characteristic of the family; *b*, *c*, two views of the gonopods with various muscles removed in *c* to show underlying details; *d*, left side of gonopods with posterior gonopod withdrawn from the gonocoel, showing its exclusive muscles. Abbreviations: C, coxite; CXA, coxal apodeme; ST, sternite; STA, sternal apodeme. Numerical muscle designations are discussed in the text, p. 108.

The entire gonopod structure can be protruded from the body by the contraction of a pair of muscles that originate near the ventral ends of the pleurotergite of segment 7 and insert on the gonopod at the ends of the sternite (fig. 2,*b*). Retraction of the genital apparatus into the body cavity is accomplished by large muscles that originate on the dorsal side of the pleurotergite and insert on the distad ends of the sternal apodemes. These two sets of muscles appear to be common to the gonopods of many helminthomorphous diplopods, and seem to be homologous to similar muscles motivating the free sternites of such orders as the Chordeumida.

The muscles that originate on the gonopod apparatus itself are not numerous but provide for a great degree of activity. They are most easily seen in caudal aspect, the accompanying figures (fig. 2,*b*–*d*) showing several successive stages of dissection as well as a cleaned gonopod for easy reference to hard parts.

The following list designates the muscles and describes their functions:

1. A large, fusiform muscle originating on the caudal side of the posterior apodeme and inserting on the base of the posterior gonopod just mesiad to the pivot joint. Contraction causes the distal end of the gonopod to swing proximomesiad.

2. Similar to 1 but originating on the anterior side of the apodeme. Function is the same.

3. A long slender muscle originating at the tip of the anterior sternal apodeme and inserting on the base of the posterior gonopod near its mesial end. Its contraction would provide extra power in support of muscles 1 and 2, and likewise prevent uncontrolled protrusion of the posterior gonopod by the contraction of 4.

4. A large, flat, twisted muscle, originating along the caudal edge of the anterior coxite, and inserting on the anterior face of the posterior apodeme. Contraction would result in extrusion of the entire posterior gonopod apparatus, the twisting presumably turning the gonopod into a position to facilitate its escape from the gonocoel.

5. A long slender ligamentous-type muscle originating on the anterior sternal apodemes and extending mesiad over 4 to join the caudal extension of the vinculum. The function of 5 is to provide stability for the caudal extension as well as to hold twisted muscle 4 in correct position during its contraction.

6. A small, short muscle originating on the tip of the coxal apodeme and inserting on the outer end of the base of the posterior gonopod (fig. 2,*d*). The muscle would retract the gonopod to get it back into the gonocoel.

7. A small slender muscle running from the anterior side of the coxal apodeme to the mesial end of the posterior gonopod and serving the same function as 1 and 2, but, judging from its origin on the coxal

apodeme, doubtless aiding in drawing the gonopod down and mesiad, and freeing it from the gonocoel.

8. A large thick muscle originating on the anterior sternal apodeme and inserting on the septum on the inner side of the vinculum. The homologs of this muscle may be found in the sternal areas of platydesmoid and chordeumoid millipeds, where the median septum is reflected externally by a median sternal ridge or knob.

9. A short band of muscle from the anterior sternal apodeme to the caudal side of the coxal apodeme. The muscle serves to swing the coxite slightly mesiad in contraction, in opposition to the action of 8.

It should be noted that the sum effect of the motor activities of the gonopods is that of a clasping organ. A hypothetical reconstruction of the procedure is submitted at this time to invoke the interest of other investigators. So far nothing has been published on the mechanics of copulation in this order, and direct observations are needed to establish the function of the gonopods.

Initially, the entire gonopod apparatus is at least partially extruded by the protractor muscles. The coxites are then spread slightly laterad by contraction of 8. Muscles 6 and 7 can then pull the posterior gonopod out of the gonocoel. This done, they relax, and the entire posterior gonopod is exserted by the contraction of 4 until the appendage is exposed and probably directed toward the head of the animal. At this point muscles 1 and 2 pull the gonopod so that the distal end swings down toward the bases of the walking legs, a position enhancing contact with the female cyphopods. Retraction is made by muscles 3, 6, and 7, with 6 and 4 then cooperating to return the appendage into the gonocoel.

Sympleurite of seventh segment: In spiroboloid diplopods, the two pairs of appendages of the seventh segment are modified as gonopods and withdrawn into the body cavity, and thus remove the two sternal elements from the normal segmental ring. The pleurites of the segment project mesiad to fuse at the midventral line and maintain segmental rigidity. In some families, such as the Rhinocricidae, there is no visible midline suture, and the combined pleurites are modified into an elevated thin flange that projects somewhat caudad and protects the exposed tips of the posterior gonopods. Most of the atopetholids, however, retain the median suture and the modified pleurites—herein designated as sympleurite—form a simple transverse bar. An exception occurs in the subfamily Arinolinae, where the sympleurite is medially enlarged and variously lobed cephalad, as shown in figure 11,*d*. Although no good comparative study could be made in this connection, it appears that each species may differ somewhat in the shape of the sympleurite at least in the genus *Arinolus*.

Legs: In most instances the leg joints maintain a uniform proportion and appearance, the order of decreasing length usually 3, 6, 2, 4, 5,

1, any variations almost always affecting the sequence of the last two or three. Modifications of taxonomic value involving leg characters are those of the ventral macrosetae or spurs, and the shape of the anterior male legs and their tarsal claws.

The occurrence of large regular spurs on the ventral apices of the leg joints is to be noted in most spiroboloids, although in the majority of groups the number and stability is greatly reduced. Atopetholids show perhaps the primitive condition in that a definite spur formula holds for each species, with only occasional variations. The coxal joint always bears a single seta, although in old specimens it may be broken off. The number increases in going distad on the leg, and the maximum number is found on the tarsal joint. Although the formula is constant for a species, the formula does not follow a phylogenetic arrangement, and one set of values may recur in several different genera. Three different formulae are given here, to indicate their occurrence: 1–1–2–2–2–6: *Centrelus kerrensis* (Chamberlin & Mulaik), *Comanchelus hubrichti*, new species, and *Arinolus torynophor* Chamberlin; 1–1–3–3–3–6: *Atopetholus angelus* Chamberlain; and 1–1–2–2–2–8: *Eurelus soleatus* Cook.

In nearly all the species examined for the character, the tarsal joint bears a few short setae on the caudal side and usually one on the cephalic face. In *Onychelus obustus*, however, these lateral setae are much more numerous and very elongated, and form a sort of fringe on each side of the leg. Conceivably this may be an aid to locomotion in dry, loose sand, *Onychelus* being known to occur in desert regions.

In many species, the coxae of the anterior male legs are produced into variously shaped lobes, the lobes of the third leg pair usually being most modified. These elaborated coxal lobes seem to characterize species rather than genera for the most part, and although probably a specialization of a sort, do not occur in obviously specialized genera such as *Arinolus*. The pinnacle of coxal development is reached in *Eurelus soleatus*, where the lobes of the third legs are elongated and deeply notched just before the end, the notches being engaged by the coxal lobes of the fourth pair with a nice interlocking mechanism, the advantage of which is difficult to imagine. In the related species *Comanchelus hubrichti*, none of the anterior male legs are lobed. In *Atopetholus angelus* the coxae are produced into small blunt cones, which reverse the normal sequence by increasing slightly from the third to the seventh leg pairs.

The large coxal lobes of *Eurelus* are accompanied by a marked reduction in the size of the tarsal claws to mere uncate remnants (figs. 4,*d–f*). These claws are likewise reduced in *Centrelus*, but are normal in size in *Comanchelus* of the same subfamily, and in most other

atopetholids are actually somewhat larger and longer than the claws of the normal postgenital limbs. It seems safe to infer that the legs of atopetholids have been variously modified or specialized in different genera to serve functional and less obvious needs, although the modifications have not taken the same direction of evolution as seen in other parts of the animals, particularly the gonopods. Taxonomically, however, the legs afford useful recognition characters, particularly in areas where two otherwise superficially similar species may occur together.

Systematic Status

Determination of the systematic position of the Atopetholidae is a matter fraught with great difficulty. Despite useful treatments by Brolemann (1914) and Attems (1926), the classification of the Spirobolida is still very unsatisfactory chiefly because no careful morphological studies have been made to determine the structural details of the male gonopods, upon which family groupings must largely be founded. Brolemann's early study provided a fairly satisfactory arrangement for its time, but since then the number of genera has increased enormously, and in few instances have the new groups been sufficiently diagnosed to enable their placement in his system. Even Attems' treatment in 1926 is objectionable because of the author's reluctance to recognize small genera or families. The genera that he placed in the "Spirobolidae" could obviously be dispersed among three or four families. These families would be small groups, of course, but it must be remembered that so far only a start has been made in the discovery and classification of the Diplopoda. Since 1926, as already remarked, the situation has become even more acute, as evidenced by the way genera have been successively interchanged from the Atopetholidae to the Spirobolidae, and vice versa, as well as the recent and lamentable redescription of one of the best-known trigoniulid species as a new genus in the Spirobolidae. The main reason for the prevailing confusion lies in the fact that few workers have taken the trouble to remove the gonopods from their specimens, and actually study them with respect to their total structure, even though Carl inveighed against this carelessness as far back as 1919.

As the record now stands, the Atôpetholidae is the only spiroboloid family whose characters are well enough known to provide a basis for understanding. Comparison with other established groups is therefore somewhat premature, yet it will be useful to point out a few obvious lines of affinity. Attems and Brolemann established a primary subordinal dichotomy in recognizing one group in which the posterior gonopods are connected by a sternal remnant, and another in which they are completely independent, the groups being recognized first as

families and then as suborders. There is now some doubt that this arrangement can go unchallenged.

That the Atopetholidae occupies a somewhat intermediate position is evidenced by the fact that Attems placed *Saussurobolus* in the Trigoniulidae despite its lack of a gonopod sternite; presumably he was influenced by the overall similarity in other respects. Yet Verhoeff considered the closely related *Orthichelus* to belong to the other suborder, and made it the type of a new family allied to the Rhinocricidae. It seems possible that both were not far from the truth, and that a division into suborders may have to be drawn along lines other than those now in use.

The group that most resembles the Atopetholidae as far as gonopod structure goes is the group typified by the East Asian *Spirobolellus*. The species of this group have the peculiar coxal apodemes, and the posterior gonopods are not strikingly different from those of the atopetholids. Another group in which coxal apodemes occur is the Rhinocricidae, which is pretty clearly a well specialized ensemble and has a distinct solenomerite on the posterior gonopods as well as a vesicle in the base of the telopodite. Stabilization of the clypeal foveolae at a constant number of four and the development of scobinae are likewise to be considered specializations.

The rhinocricid posterior gonopod preserves the same number of segments as are found in the atopetholids, but differs in that the coxae are vertical instead of transverse. It is easy to see the similarity of this appendage in *Piedolus* and *Eurhinocricus*. At the present, it seems reasonable to regard the Atopetholidae as a very primitive family whose progenitors doubtless gave rise to the existing families Rhinocricidae and Spirobolellidae as well as, perhaps, to the Trigoniulidae. There are, unfortunately, no species of spiroboloids which have retained most of the primitive characters. We can assume that the most primitive gonopods are those that most nearly approximate the original walking-leg structure, and on this basis the anterior gonopods of *Comanchelus* are those that are least modified. Retention of a sternite remnant between the posterior gonopods—obviously a primitive character—is known only in the Trigoniulidae, but in this group the gonopods are strongly specialized by the presence of coxal vesicles and associated seminal groove and solenomerite. It therefore seems safe to assume *Comanchelus* to be, probably, the most primitive of existing spiroboloids as its gonopod structure could not be any more generalized without the subdivision of the telopodite into several segments.

Within the family, then, the least specialized group is the Eurelinae, followed closely by the Atopetholinae. *Onychelus*, which is in a subfamily of its own, is somewhat aberrant and out of the main line of

evolution, it having developed a rhinocricid-type anterior gonopod and several modifications for desert life while remaining unspecialized in other respects. In the Arinolinae we reach the apex of atopetholid evolution, with numerous localized species, the appearance of rudimentary scobinae, and development of a distinct solenomerite on the posterior gonopod, as well as a fundamental change in the location of the ozopores and a loss of the original primitive segmental sutures.

Genera Incorrectly Referred to the Atopetholidae

At various times in the past certain genera have been either listed in the family Atopetholidae or associated otherwise with genuine atopetholid genera. Aside from inadvertant or careless listings, the following names warrant comment:

Anelus Cook, 1911, p. 160.

Type species: *Anelus reduncus* Cook, by original designation.

Unfortunately, the type specimen of this genus and species has been misplaced and is not available for study. On the basis of Cook's description, and that of the related *A. richardsoni* (Pocock), as well as the examination of a female *reduncus* taken near the type locality, it seems that the genus departs sufficiently from normal atopetholid structure to warrant exclusion from the family. Cook's paper, published before the Atopetholidae was proposed, considered *Anelus* to be a close relative of *Eurelus* and *Onychelus*, but *Anelus* probably belongs to a presently undefined Neotropical family.

Banosolus Wang, 1951, p. 28.

Type species: *Banosolus phillippinus* Wang, by original designation.

This genus was originally proposed as a member of the Atopetholidae, an allocation that needs verification by restudy of the type specimen. The original illustrations leave much to be desired, and the locality involved makes it seem possible that the genus may actually belong to the related family Spirobolellidae, which is well represented in the Indo-Australian region.

Cyclothyrophorus Pocock, 1910, p. 83.

Type species: *Cyclothyrophorus salvini* Pocock, by original designation.

The remarks made for *Anelus* apply equally well in this case. Details of gonopod structure are as yet virtually unknown, but the weight of evidence suggests exclusion of this genus from the Atopetholidae. Possibly, however, some of the species which Pocock tentatively associated with *C. salvini* may prove to be atopetholids, as we know to be true of *Julus nietanus* Saussure, which was listed in this genus by Pocock (1910). If *salvini* upon restudy proves to be an atope-

tholid, it almost certainly will be necessary to recognize an additional subfamily for *Cyclothyrophorus*.

Messicobolus Brolemann, 1914, p. 32.

Type species: *Spirobolus godmani* Pocock, by original designation.

This genus of large robust spiroboloids has been referred to the Atopetholidae in recent papers by R. V. Chamberlin, but the good figures of the gonopods published by Carl indicate clearly that *Messicobolus* and the possibly synonymous *Oxobolus* constitute a distinct taxonomic group well differentiated from other presently recognized spiroboloid families.

Atopetholid Genera of Uncertain Position

The following generic names appear to be based on species of the Atopetholidae, but are so poorly described that it is impossible to refer them to a subfamily with any degree of confidence.

Hesperolus Chamberlin, 1918, p. 170.

Type species: *Hesperolus wheeleri* Chamberlin, by original designation.

The original description of *H. wheeleri* included no illustrations, and it is difficult to visualize the gonopodal structure from the description. The tiny species was collected in the Santa Ynez Mountains near Santa Barbara, California, and it is hoped that topotypes can eventually be obtained and studied for a correct placement of the genus.

Tidolus Chamberlin, 1949, p. 169.

Type species: *Atopetholus parvus* Chamberlin, by original designation.

The type species was described as an *Atopetholus*, and the diagnosis of *Tidolus* is largely a comparison with that genus. Here again, however, the type species is not illustrated, and the brief description of its gonopods is not sufficient to provide a good idea of their form. Since *parvus* was collected at Claremont, California, it should not be difficult for some collector to eventually secure topotypical specimens.

Family Atopetholidae Chamberlin

Atopetholidae Chamberlin, 1918, p. 167; 1949, p. 168.—Chamberlin and Hoffman, 1958, p. 152.

Onychelidae Verhoeff, 1938, p. 273.

Small to medium sized spiroboloids, characterized by the structure of the male gonopods. The anterior pair consists of a transverse or moderately arched sternite, with the usual sternal apodemes; coxae of normal configuration, separated by a median thickening of the

intersegmental membrane or held apart by a median distal projection of the sternite, produced proximally into conspicuous coxal apodemes; telopodite typically small and largely concealed behind the coxites in anterior aspect. Posterior gonopods rather small, concealed within a gonocoel formed by the anterior pair; their apodemes long and slender, reaching dorsal side of pleurotergite, loosely jointed with the transverse basal coxal element; telopodite usually fused with the latter at a right angle. Posterior gonopods set transverse to the longitudinal body axis, but not connected by a sternal remnant.

Head small, clypeal foveolae 3–3 to 5–5, varying within a species; ocellaria of normal size, ovoid to rounded, with 30 to 50 ocelli in each; antennae variable in length, held in a depression in the face of the mandibular stipe, with 4 terminal sensory cones.

Collum wider than head, laterally acuminate, the anterior lateral edge set off by a distinct groove. Second segment usually about as long as collum but not produced forward under its tip, the pleural element produced mesiad, its anterior edge usually elevated as a distinct flared margin. Surface of tergites smooth or very finely punctate in most species; in some species the lower sides are adorned with longitudinal striations that may be produced beyond the caudal edge of the segments in the form of acute spinulae. Tergites with two transverse sutures, a median dorsal suture, and a lateral suture on each side at level of the ozopores, the ozopores opening in the mesozonites except in the subfamily Arinolinae. Rudimentary scobinae occur in at least one genus (*Scobinomus*). Anal tergite blunt, rounded, shorter than valves; latter inflated, their inner margins meeting at a reentrant angle and provided with a comb of fine, closely set bristles, otherwise glabrous. Preanal scale usually broadly ellipsoid, nearly flat, but occasionally modified slightly (*Centrelus*). Legs moderate in length, the sixth joint longest, ventral macrosetae of legs apparently constant within a genus, varying from 1–2–2–2–2–6 to 1–1–3–3–3–8. Sternites rectangular to trapezoidal, usually widest in front, with 6 to 12 or more transverse ridges or striae. Coxal lobes of anterior legs variable, from small conical productions to elongate and specialized structures, those of the third pair usually largest, extending caudad over or between those of the following pair. Tarsal claws of the third to sixth legs may be normal, rudimentary, or hypertrophied, their form a specific rather than generic character.

The genera that we have been able to recognize fall into four natural groups probably worthy of subfamily rank although some appear to be much more differentiated than others. These groups may be characterized by the following key:

Key to the subfamilies of Atopetholidae

1. Ozopores opening in the metazonite. Posterior gonopods with distinct solenomerite of varying size and shape. Coxites of anterior gonopods with well-defined oblique grooves setting off the lateral surface ARINOLINAE (p. 147)

   Ozopores opening in the mesozonite. Posterior gonopods without solenomerite or seminal groove. Coxites of anterior gonopods entire, without oblique grooves 2

2. Sternite of anterior gonopods strongly arched mesially, the suprasternal membrane sclerotized and fused with it to form a flat subtriangular pseudosternite; sternal apodemes of anterior gonopods curved inward distally, those of posterior gonopods greatly expanded at the end. Legs with numerous long bristles on the sides in addition to the normal short ventral setae . . . . ONYCHELINAE (p. 147)

   Sternite of anterior gonopod transverse or moderately arched; intersegmental membrane sclerotized an as intercoxal vinculum of various shape but never as a flat triangular plate fused with the sternite. Legs without long lateral setae. Apodemes of posterior gonopod not strongly expanded distally 3

3. Segments with one distinct transverse suture. Vinculum broad and heavily sclerotized with a median groove or depression extending caudad between the coxae and more or less in contact with the sternite ATOPETHOLINAE (p. 132)

   Segments with two distinct transverse sutures. Vinculum small and separated from the sternite by a large expanse of thin connective tissue EURELINAE (p. 117)

Eurelinae, new subfamily

The atopetholids assigned to this distinct and homogeneous subfamily are all fairly large in size and include the largest known representatives of the family. In general form the species tend to be robust and heavy-set, abruptly tapering at both ends of the body, and with the head and column distinctly smaller than the second and succeeding segments. The ocellaria are well-developed, each with 30 to 50 or more ocelli. Normally the pleurotergites are smooth and without distinct punctations. The color in life appears to be, usually, some uniform shade of gray or olivaceous; in preservation the segments may develop annulations of darker color. There is considerable variation in secondary sexual characters of the males: Coxal lobes and claws of the anterior legs may be absent, normal, or hypertrophied, the variation in general tending to reflect specific rather than generic differentiation. The gonopods are basically similar, and are characterized by the considerable amount of sclerotized membrane between the true sternite and the coxae. There is a more heavily sclerotized midpiece, the vinculum, occupying a rather isolated position between the coxites, and presumably serves as a

spacer to maintain rigidity of form in lieu of the sternite, which usually assumes this function in spiroboloids.

The distribution of the Eurelinae (fig. 3) is distinctly Texan—all the three known genera and three of the six species occurring in this State. The others are recorded from the Mexican States of Chihuahua, Nuevo León, and Guanajuato—all on the eastern side of the Mexican Plateau. One species, *Eurelus mulaiki* from New Mexico, is unknown to us. From the drawings of its gonopods, as well as the disjunct distribution, it seems possible that *mulaiki* may represent another generic type within the limits of this subfamily. Those of which we have examined material may be distinguished by the characters selected for the following key:

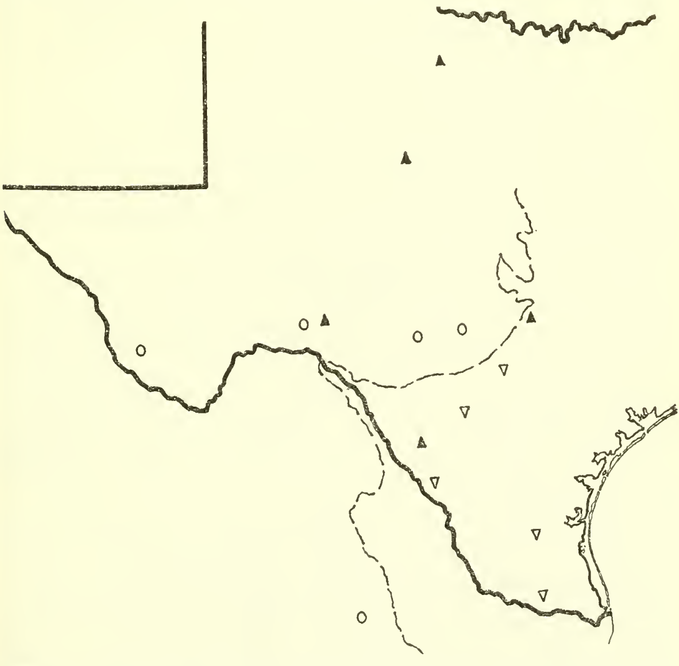

FIGURE 3.—Map showing the known localities for three species of the Eurelinae in Texas and Nuevo León: ▲ *Comanchelus hubrichti;* ○ *Centrelus kerrensis;* ▽ *Eurelus soleatus.* The broken line approximates the 1,000-foot contour, which apparently separates the ranges of *soleatus* and *kerrensis.*

Key to the genera of the subfamily Eurelinae

1. Lower portion of the pleurotergites with a series of 6 to 10 sharp recurved spines on the caudal margin just above the legs; collum of male with the anterior margin set off by a distinct deep groove, and prolonged ventrad into a rounded lobe extending below the level of the second tergite (fig. 5*c*); apex of coxite of anterior gonopod with a fleshy membranous lobe (fig. 5*a*), otherwise quite similar to that of *Eurelus;* coxal lobes of anterior legs well developed . . . . **Centrelus** Cook

   Lower portion of pleurotergites not produced into spinules on the caudal margin; collum of male with anterior edge set off by a moderate groove and not, or but slightly, produced ventrad as a rounded lobe; coxites of anterior gonopods without trace of membranous lobes (figs. 4*a*, 6*a*). 2

2. Sternite of anterior gonopods nearly straight across; tarsal claws of legs 4–7 of males normal in size and shape; coxal lobes of these legs very small; ventral setae of legs 1–1–2–2–2–6 . . . . . . **Comanchelus,** new genus

   Sternite of anterior gonopods of male distinctly arched; tarsal claws of legs 4–7 of males reduced to tiny vestiges; coxal lobes of anterior legs very large and elaborated; ventral setae of legs 1–1–2–2–2–8 . . . **Eurelus** Cook

Genus *Eurelus* Cook

Eurelus Cook, 1911, p. 161.

Type species: *Eurelus soleatus* Cook, by original designation.

Diagnosis: A genus of stout-bodied eurelines in which the anterior tarsal claws of males are reduced to mere vestiges while the coxal lobes are greatly enlarged. The caudal edges of the pleurotergites are not provided with upturned spinules.

Discussion: Although both the generic name and its only included species were described at great length by Cook, he provided no illustrations of the gonopods or other structures, and it is therefore not surprising that *Eurelus* has become something of a pitfall to later workers. The recent acquisition of material clearly referable to *E. soleatus* makes it possible to clear up the mystery satisfactorily.

Subsequent to Cook's 1911 paper, the first reference to the genus appeared in an article on Texan millipeds by Chamberlin and Mulaik (1941), in which two new names, *proximus* and *kerrensis,* were proposed in *Eurelus.* Unfortunately these authors followed Cook's precedent and presented no drawings of the new forms and thus compounded the difficulties. Most of their descriptions consisted of comparisons with that of *soleatus,* and dealt only with very variable structural details. Two years later (1943b), Chamberlin described a third new form, *Eurelus mulaiki,* from New Mexico. We now believe that *proximus* is a synonym of *soleatus,* that *kerrensis* belongs to a different genus, and that *mulaiki* is for the present a sort of species inquirendum.

In 1949 Hoffman described, under the name *Toltecolus parvunguis,* a specimen of what is almost certainly *E. soleatus.* Comparison was made solely with the published descriptions of *Toltecolus garcianus*

and *T. chihuanus*—both now placed in other genera—and the description of *soleatus* overlooked entirely.

At the beginning of the present study, therefore, four names had been proposed in *Eurelus*, and still another had been set up in a related genus although actually based upon *soleatus*. On the basis of all available information, we propose to consider *Eurelus* as monotypic, considering two of the later names as junior synonyms of *soleatus* and transfering another to *Centrelus*. The remaining name, *mulaiki*, is almost surely not congeneric with *soleatus*.

Eurelus soleatus Cook

Figures 1, 3, 4

Eurelus soleatus Cook, 1911, p. 153.

Eurelus proximus Chamberlin and Mulaik, 1941, p. 62 (male holotype from Edinburg, Texas, in the collection of R. V. Chamberlin, collected by Stanley Mulaik, 1938).

Toltecolus parvunguis Hoffman, 1949, p. 1, figs. A, B (male holotype from Frio County, Texas, USNM 1853, collected by G. E. Ball, April 8, 1948).

Holotype: Male, USNM 801, from Falfurrias, Brooks County, Texas, collected in August 1906, by O. F. Cook.[4]

Diagnosis: A large smooth-bodied atopetholid, 60 to 70 mm. in length and up to 8.0 mm. in diameter, with 46 to 49 segments. 40 to 50 ocelli in each rounded ocellarium. Tarsal claws of fourth–seventh legs of male greatly reduced; coxal lobes of third legs (fig. 4*d*) elongated and produced caudad, notched about their midlength and embraced by coxal lobes of fourth leg pair. Sternite of male gonopods distinctly arched medially, separated from the coxites by a considerable area of thin sclerotized membrane. Apices of coxites conically acute, finely punctate. Posterior gonopods robust, telopodite produced distally into a short truncate lobe and an opposed laminate terminally expanded process.

Description: The very detailed description published by Cook cannot be improved upon except with respect to the genitalia, which are now illustrated in detail for the first time.

From the anterior aspect, the anterior gonopods are dominated by the laterally arched coxites, which contact the sternite only slightly at its lateral ends. Mesially the coxites are separated by the intercalary vinculum, formed by thickening and sclerotization of the connective tissue between them and the sternite. The sternite is distinct and subtransverse, but narrower and somewhat arched near the median line. Laterally the sternite becomes broader and gives

[4] This specimen was misplaced by Cook in the main body of the Museum's diplopod collection, and has not yet been recovered for segregation in the type series.

rise to the elongate, slender sternal apodemes. On the caudal side the sternite becomes attenuated and merges with the base of the coxites. The coxites are rather massive and laterally arched, divided on the anterior face into two subsegments by a distinct suture, which, in passing around to the caudal side, broadens into an articulation. Both of the subdivisions of the coxae contribute to the elongate coxal apodeme (fig. 4,*b*), which extends ventrad from both the cephalic and caudal apices of the coxae, and represents a prolongation of the gonocoel formed by each coxa for the accommodation of the posterior gonopods. Superficially the caudal edge of the coxal apodeme appears to be continuous with the mesial margin of the telopodite, but there is actually no connection, and the telopodite is attached to the coxite by a movable articulation.

The posterior gonopods are rather short and robust, and the coxal apodeme is half again as long as the coxotelopodite. The latter has a subtriangular base resulting from consolidation of the acutely angular space formed by the telopodite and coxite in such genera as *Arinolus* and *Onychelus*. Distally the telopodite ends in two lobes—one a subterminal, truncate, marginally fimbriate lobe on the caudal side, and the other an obtusely rounded spatulate terminal lobe. The apodeme is attached a short distance from the mesial end of the coxotelopodite.

The coxal lobes of the anterior male legs are illustrated in figure 4,*d–f*. When in place, the distal third of the processes of the third coxae are clasped by those of the fourth, the interlocking facilitated by a subterminal notch on each of the former. In the drawing, made from a slide mount, the terminal portion distad of this notch is shown as bent somewhat laterad; normally it is directed caudomesiad and in line with the rest of the process. The coxal lobes of the fourth and fifth legs are flat and laminate, the distomesiad corner of each bent caudad and then laterad to form a slight hook. Prefemora of anterior legs unmodified, but femora of each with a distinct rounded projecting lobe at the base. Tarsal joints definitely flattened or depressed on the dorsal surface.

Discussion: Variation: On the basis of our moderate series of mature specimens from a single locality, it is possible to determine something of the individual variability in this species. Heretofore, some authors have assumed that all individuals of a population must be identical, and have made the slightest deviation from a known standard (even from a single specimen) the basis of creation of new species. We have investigated variability in several characters frequently thus misused in spiroboloids.

Segment number: Cook found that 4 of his specimens had 48 segments and 1 had 47. In 12 specimens at hand, we observed the

following frequency distribution: 46 segments in 2 specimens, 47 in 2, 48 in 5, and 49 in 3. The statistical mean for this series is 47.7, with a standard deviation of 1.06. Although the series is not large, a spread of 6 standard deviations should include about 99 percent of the total variability to be expected for an unlimited series from the locality sampled. Numerically this yields an expected range in segment number of 44 to 51, actually not much greater than the observed range in the material studied.

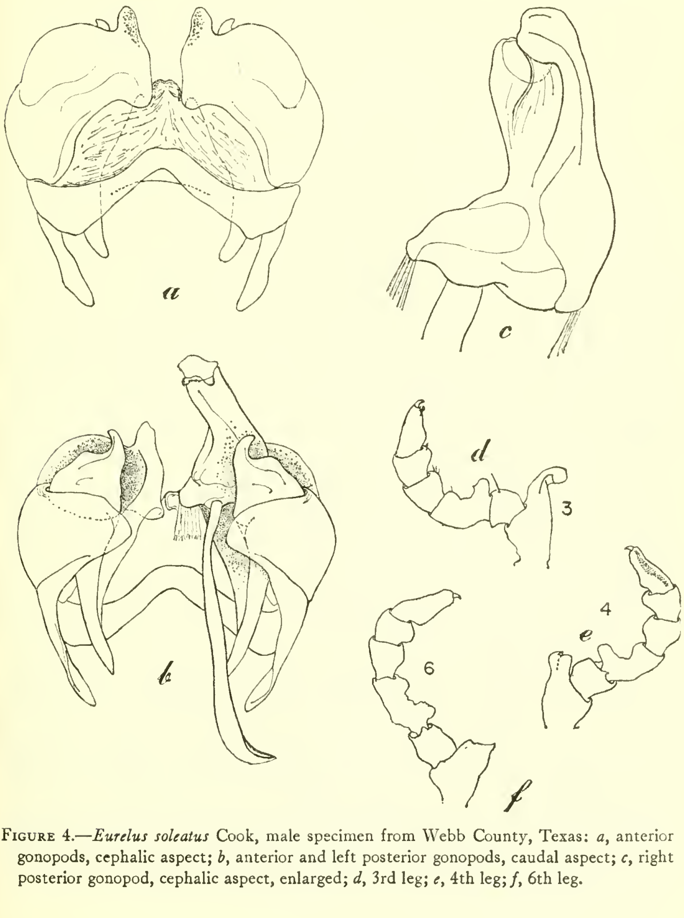

FIGURE 4.—*Eurelus soleatus* Cook, male specimen from Webb County, Texas: *a*, anterior gonopods, cephalic aspect; *b*, anterior and left posterior gonopods, caudal aspect; *c*, right posterior gonopod, cephalic aspect, enlarged; *d*, 3rd leg; *e*, 4th leg; *f*, 6th leg.

Clypeal foveolae: Some taxonomists attach considerable importance to the number of these supralabial pits, and even go so far as to establish species and genera on slight variations in the total number. In some groups, such as the Rhinocricidae, the number may be fixed and constant, in others, including the Atopetholidae, there is considerable variation within a species. Our series of *E. soleatus* yielded the following counts: 3–3 in 4 specimens, 3–4 in 1, 3–5 in 2, 4–4 in 4, and 4–5 in 1. Cook found "five clypeal foveolae on each side, sometimes only four." Apparently the number ranges from 3–3 to 5–5, with 4–4 occurring most frequently. The foveolae appear to afford a very weak basis for the establishment of any grade of taxonomic category, particularly when it is based on a single specimen.

Number of ocelli: Cook gave ocellus counts for one of his types, 43 on one side and 44 on the other. We have made counts from 4 specimens taken at random, and find considerable variation: 49–51; 49–45; 40–41; 44–46. So few numbers cannot be satisfactorily analyzed statistically, yet it should be obvious that the number of ocelli varies at least from 40 to 50 in each ocellarium, and the probability is that the expected range will be slightly greater. Here again is another character which should be used with the greatest caution, if at all, for the discrimination of species.

It should be stated, moreover, that we anticipate the establishment of geographic variational clines in many structural characters of millipeds. If this proves to be the case, the total ranges of variation within a species—particularly a widely distributed form—will doubtless prove to be much greater than we have indicated for material from a single locality.

Synonymy: Upon consideration of the known variability of *Eurelus soleatus*, we can find nothing in the description of *E. proximus* to warrant its recognition as a valid species or subspecies. The statement was made that *proximus* is closely related to *soleatus*, but differs in being slightly smaller, with 45 segments instead of 48 ("apparently the normal and nearly constant number in *soleatus*"), and in having the first segment dark instead of light, as mentioned in Cook's description. Another point of difference drawn from the single type specimen was that the posterior gonopod was extruded.

The figures cited for both size and segment number in *proximus* are included in the known range of variation in *soleatus*. The ostensible difference in coloration is very unreliable inasmuch as the color of preserved material is known to vary with both the method and duration of preservation. The exposure of the posterior gonopod in the type of *proximus* is of course meaningless, since these appendages are extrusible in all spiroboloids; whether they happen to be protruded at the time of preservation is entirely accidental, and does not so far

as is known reflect a peculiarity of any rank of taxonomic group. In our series of 12 male *soleatus*, 3 or 4 have one or the other of the posterior gonopods protruded for various distances.

There is no reason for maintaining *Toltecolus parvunguis* as a separate species. The name was proposed in ignorance of Cook's 1911 paper, and was set up as a new species on the basis of contrast with the Mexican *Toltecolus garcianus* Chamberlin (=*Centrelus kerrensis*). The description agrees in every particular with the material that we have identified with Cook's *E. soleatus*.

Distribution: The Coastal Plain of southern Texas, between the Rio Grande and Colorado Rivers. The type specimens were taken by Cook at Falfurrias, Brooks County, and he had additional specimens from San Antonio, Bexar County, and Moore, Frio County. The type of *E. proximus* is from Edinburg, Hidalgo County, and that of *T. parvunguis* from Frio State Park, Frio County. The series of millipeds at hand was collected along the highway 35.5 miles northwest of Laredo, Webb County, May 29, 1955, by Leslie Hubricht. This locality in the Rio Grande Valley is the westernmost now known for the species. The occurrence of *soleatus* in adjacent parts of Mexico, however, is certainly to be expected.

Genus *Centrelus* Cook

Centrelus Cook, 1911, p. 154.
Toltecolus Chamberlin, 1943a, p. 27 (type species: *Toltecolus garcianus* Chamberlin).

Type species: *Centrelus falcatus* Cook, by original designation.

Diagnosis: A eureline genus similar to *Eurelus*, from which it differs conspicuously in the presence of distinct upcurved spines on the lower caudal edge of the pleurotergites. In the male sex the anterior tarsal claws are reduced, and the coxal lobes well developed; coxites of the anterior gonopods with a large fleshy membranous lobe near the apex on the anterior side.

Discussion: The original generic diagnosis itemized external structural details at some length but touched only briefly on the genitalia, and gave no illustrations of these appendages. *Centrelus* thereupon slipped into a justifiable obscurity, and the name has not appeared again in the literature.

Texan material received from Leslie Hubricht agrees so closely with the description of *Centrelus* that we have no doubt it is at least congeneric with the type species. On this basis we have illustrated the pecularities of the gonopods, and herewith suggest the identity of *Toltecolus* with *Centrelus*, as well as some specific synonymy to be discussed in a following paragraph. The type species *C. falcatus* Cook, is from the State of Guanajuato; the other known species, *C. kerrensis*, is known to occur in Nuevo León and in western Texas, and suggests

a generic range along the Sierra Madre Oriental, with additional species probably remaining to be discovered.

Centrelus falcatus Cook

Centrelus falcatus Cook, 1911, p. 156.

HOLOTYPE: Male, USNM 800, from Guanajuato, Mexico, probably collected by A. Duges.[5]

DIAGNOSIS: A small species of *Centrelus* about half the size of *C. kerrensis*, and with only 3 or 4 lateral spines on each segment instead of 6 to 10 as in that species.

DESCRIPTION (FROM COOK): Length of male about 38 mm., width about 3.0 mm.; female about 42 mm. by 4.5 mm.

Clypeal foveolae 4–4; surface of vertex and clypeus smooth; ocellaria oval or trapezoidal, each with about 40 ocelli in 7 or 8 rows.

Marginal ridge of the collum broad, and the lateral angle rather rounded, not projecting below the second segment as in *Eurelus*. Second segment with the anterior margin decurved.

Surface of segments nearly smooth, very finely and indistinctly punctate and longitudinally striate above; lateral and ventral striations very short, confined to the metazonite, surface below each striation smooth. Segments behind middle of the body with the striations well separated, only three or four on each side, and produced into distinct sharp spines curving obliquely upward.

Last segment smooth, the apex very broadly triangular-rounded, distinctly exceeded by the strongly convex, smooth, anal valves. Preanal scale very broadly rounded.

Centrelus kerrensis (Chamberlin and Mulaik), new combination

FIGURES 3, 5

Eurelus kerrensis Chamberlin and Mulaik, 1941, p. 61.—Chamberlin and Hoffman, 1958, p. 156.

Toltecolus garcianus Chamberlin, 1943a, p. 27 (male holotype from Garcia, Nuevo León, Mexico, in the collection of R. V. Chamberlin, collected by C. Bolivar and F. Bonet, July 14, 1942.)

HOLOTYPE: Male, collection of R. V. Chamberlin, from Raven Ranch, Kerr County, Texas; collected in July 1939 by Stanley and Dorothea Mulaik.

DIAGNOSIS: A moderate to large sized eureline characterized by the number of segments (50–53) and ocelli (35–45), differing from *C. falcatus* as well as other eurelines in having as many as 8 to 10 stout marginal spines on the lower sides of the metazonites.

DESCRIPTION (male from Real County, Texas): Body 65.0 mm. long and 6.5 mm. in diameter, with 51 segments.

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[5] This specimen was misplaced by Cook in the main body of the Museum's diplopod collection, and has not yet been recovered for segregation in the type series.

Color of preserved specimen nearly uniform black, the extreme caudal edges of the metazonites silvery white to gray, possibly due to color change in alcohol.

Front of head smooth and polished except for several distinct transverse grooves in the clypeal region; epipharangeal groove distinct up to interantennal space; genae with about 12 distinct short striations extending to the margin of the head. Ocellaria small and nearly circular, ocelli all nearly equal in size and shape, arranged in 7 rows as follows: 4, 5, 6, 6, 6, 6, 5—a total of 38; interocular space almost 4 times the diameter of an ocellarium. Antennae small and short,

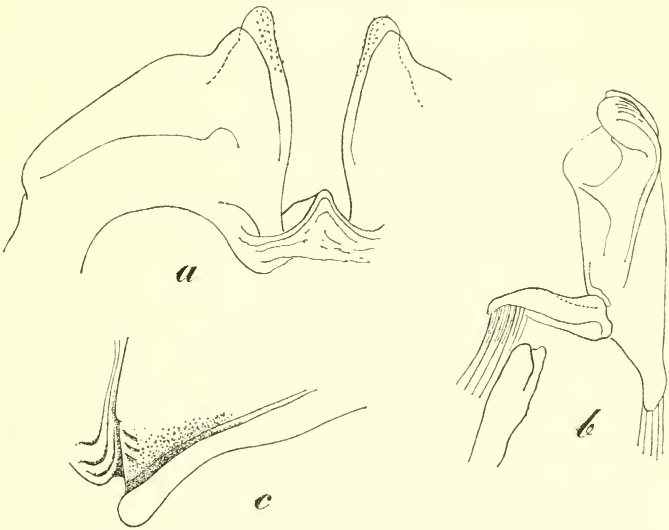

Figure 5.—*Centrelus kerrensis* (Chamberlin and Mulaik), male specimen from Real County Texas: *a*, distal half of anterior gonopods to show the membranous lobe in front of the coxal apex; *b*, right posterior gonopod, cephalic aspect; *c*, lower end of collum of left side.

the first three articles glabrous, distal four finely setose; second article longest, third through sixth slightly smaller and all subequal, all articles about the same width.

Collum somewhat wider than head but narrower than following segments, its surface smooth and polished; lateral ends as shown in figure 5c; second segment with about five distinct ridges behind end of collum, the lowest of which is actually knobby in contour; pleural lobe with a moderately elevated anterior ridge. Following segments similar to second but with ridges less prominent. Near middle of body the ridges become gradually more produced and project beyond

margin of segments as a series of 6 to 10 sharp upcurved spines. Ventral surface of mesozonites in front of the ridges with a distinct reticulate pattern of fine striae, the striae merging dorsally into transverse parallel ridges that fade out near the level of the ozopores. Transverse sutures very distinct; metazonites slightly elevated.

Three segments in front of the telson strongly telescoped. Telson bluntly acuminate, equalling but not surpassing the anal valves, latter smooth and evenly convex, with their ventrolateral corners depressed and wrinkled. Preanal scale broad, divided by a transverse furrow into two heavily striated portions, the basal part strongly depressed at the lateral ends, the distal half noticeably inflated or convex.

Sternites trapezoidal, with 12 to 16 transverse parallel ridges; stigmata entirely enclosed within the sternites. Legs rather long and slender, the two distal joints visible from above body, all joints smooth and polished, their decreasing order of length: 3, 6, 2, 1, 4, 5. Ventral setal formula: 1, 1, 2, 2, 2, 6.

First two pairs of legs crassate, with long robust claws; legs 3–7 of normal size and shape; third legs with claws of normal size, the others back through the seventh with claws reduced to a tiny vestige, the tarsi of these legs strongly depressed on the dorsal surface. Coxal lobes of third legs erect, slender, and membranous, their tips bent slightly cephalad and then caudad as seen in lateral aspect; lobes of legs 4–7 flat, simple, wedge-shaped, becoming smaller posteriorly.

Sympleurites of seventh segment broadly in contact at the median line with a distinct suture evident; the anterior edge continuing the curve of the segment, the posterior edge elevated and overhanging.

Anterior gonopods very similar to those of *Eurelus soleatus* but differing in the presence of a distinct membranous lobe on the anterior side of the coxal apex (figure 5,*a*). Posterior gonopods rather robust and straight, the telopodite ending in two distal lobes as shown in figure 5,*b*. No trace of a seminal groove can be detected.

Discussion: Variation: In most structural details this species is quite stable over its considerable range. The gonopods of our male from Real County, Texas, match perfectly with the illustrations of the type specimen of *T. garcianus*.

Combining counts from specimens at hand and published information, we have nine counts of segment number, ranging from 50 to 53 with a mean of 51.4. The standard deviation for this series is 1.33. There is a slight indication that the number increases in going north, but this gradient is probably too slight and gradual to be of much significance. Throughout the area occupied by the two species jointly, there is very little overlap in segment count in *C. kerrensis* and *E. soleatus*.

Six ocellus counts are as follows: 33, 35, 37, 37, 39, and 42. Here there seems to be neither sexual nor geographic variation, but the series is too short to be of particular value.

The size appears to vary considerably. The largest known specimen is a female from Garcia, Neuvo León, 75 mm. long and 8.0 mm. wide; the smallest is a female from Pandale, Texas, about 40 mm. long and 5.0 mm. wide. The small specimens appear to be structurally identical with larger ones.

Clypeal foveolae vary from 4–4 to 5–5, and are somewhat more constant than in *E. soleatus*, in which counts of 3–3 are noted as well.

Synonymy: The synonymy of *Eurelus kerrensis* and *Toltecolus garcianus* was established in the following manner. The adult male from Real County, Texas, was found to agree perfectly with the drawings given for *garcianus* as well as with the description, as far as it goes. This specimen also matched the original diagnosis of *Centrelus* very closely, leaving little doubt that it is congeneric with *C. falcatus*, and on this basis we determined two collections from Texas as *Centrelus garcianus*. However, when a map of the known records of the Eurelinae was prepared, it was observed that Real County is geographically adjacent to Kerr County, whence came the type series of *E. kerrensis*. Comparison of our material with the description of that species, moreover, showed a remarkable concordance in every particular except that metazonite spines were not mentioned for *kerrensis*. On the chance that they may have been overlooked, we requested Chamberlin to examine the types for this character. He very kindly did and reported (in a letter dated May 30, 1957) that small but distinct and upturned spines are actually present. This discovery removed the last obstacle for presuming that *kerrensis* is the older of two names applied to a spiroboloid population which occurs in the plateau country of Texas and adjacent Nuevo León. Although we have been unable to study the type specimens of either name, we feel that the available evidence as outlined above makes the likelihood of error quite remote.

Distribution: *Centrelus kerrensis* is now known to have a fairly wide range over much of western Texas and adjacent Nuevo León. From the existing records and the fact that it has not so far been found in the Rio Grande Valley, we assume that it is an upland form. The type locality was Raven Ranch, in Kerr County, Texas (Chamberlin and Mulaik, 1941), and the species was subsequently recorded (under the name *Toltecolus garcianus*) from Garcia, near Monterey, Nuevo León (Chamberlin, 1943a). Material has been seen from the following new localities:

Texas: Real County: 10 miles north of Leakey, June 10; 1955, Leslie Hubricht (R. L. Hoffman). Presidio County: Near Porvenir, September 28, 29, 1946, Bryan

Patterson and J. M. Schmidt (Chicago Nat. Hist. Mus.). Val Verde County: 3.3 miles northeast of Pandale, June 11, 1955, Leslie Hubricht (USNM).

Comanchelus, new genus

Type species: *Comanchelus hubrichti*, new species.

Diagnosis: A eureline genus in which the tarsal claws of the anterior legs are not reduced, and the coxal lobes, if present, are simple with usually only those of the third leg pair enlarged. Sternite of the anterior gonopods nearly transverse; sternal apodemes not completely fused to the coxites on the caudal side (fig. 6,*b*).

Discussion: This genus is proposed for two species which although generally similar to *Eurelus soleatus* appear to diverge enough to justify their recognition as a separate group. The number of segments is about the same as in *soleatus* (45 to 52), but the species appear to average somewhat smaller in size. Probably the most reliable means of recognizing the genus will be found in gonopod characters.

In addition to the type species, we tentatively refer here the form named *Toltecolus chihuanus* by Dr. Chamberlin (1947a). As far as can be ascertained from the original description and illustrations, the species appears to be closely related to *C. hubrichti*, but a careful study of the gonopods of *chihuanus* is needed for a final confirmation of its systematic position.

Comanchelus chihuanus (Chamberlin), new combination

Toltecolus chihuanus Chamberlin, 1947a, p. 10, figs. 5–7.

Holotype: Male, collection of R. V. Chamberlin, from Chihuahua City, Chihuahua, Mexico, collected on July 23, 1944, by V. E. Shelford.

Diagnosis: The coxae of the third leg pair are produced into elongated, cylindrical lobes. Posterior gonopods with a rounded subterminal lobe on the caudomesial margin instead of a laminate, acutely projecting blade as in *C. hubrichti*.

Description (from Chamberlin):

Color a dark, olive gray, with dark annuli about caudal borders of metazonites. Legs dark chestnut.

Clypeal foveolae 5+5. Eyes very widely separated; ocelli arranged in 8 longitudinal series and the same number of transverse series.

Collum strongly narrowed down each side as usual, with the anterior margin conspicuously incurved at lower end, the elevation decreasing dorsad, the elevated border set off by a sulcus (fig. 5).

Segments smooth above. A true segmental sulcus absent above, though below indicated by a faint line which bends forward angularly at level of pore which it touches. Segments strongly striate below. Anal tergite rounded behind, the surface over caudal portion irregularly rugose.

In the male the first two pairs of legs are thickened and have the claws strongly enlarged. The claws of the following three pairs of legs also have enlarged claws but these decreasing from third pair to fifth.

Coxal processes of third legs of male extending back over bases of fourth legs, subcylindrical but with ventral face flattened or concave, the distal ends abruptly uncate.

The gonopods are as shown in the figures. Anterior sternite subquadrate; firmly seated in the shallow excavation on anterior face of gonopods.

Number of segments in the male holotype, 51.

Diameter, 4.8 mm.

RANGE: This species is known so far only from the type locality.

***Comanchelus hubrichti*, new species**

FIGURES 3, 6

HOLOTYPE: Male, USNM 2507, and paratypes of both sexes, from 3.3 miles northeast of Pandale, Val Verde County, Texas, collected on June 11, 1955, by Leslie Hubricht.

DIAGNOSIS: A species in which the anterior coxae of males are not produced into lobes or processes, and in which the posterior gonopod is produced mesially into a thin, acutely angled lamina, its apex distally exceeding the main body of the appendage.

DESCRIPTION (PARATYPE MALE): A stout bodied atopetholid, nearly parallel-sided, with the head and collum narrower than the following segments; last four or five segments much smaller than their predecessors and distinctly telescoped. Color uniform olive-gray.

Head ovoid, slightly flattened frontally, surface smooth and polished, sunk in collum to edge of the ocellaria. Labral sinus deep and acute; clypeal foveolae 4–4, those nearest the midline set closer together. Geneae short and unmargined, exceeded by the second antennal article. Ocellaria rounded-ovoid, separated by about 2.7 times the diameter of each, ocelli variable in size and number, those nearest the mandibular suture much the largest, those near the front of head small and unpigmented, and easily overlooked, 41 on one side, 42 on the other.

Antennae short and slender, not reaching caudal edge of collum; second article largest and longest, the others decreasing in size distally; articles with scattered setae except sixth and seventh, which are fairly thickly clothed with recumbent setae. Outer face of mandibular stipe with a somewhat elevated caudal margin, the discal depression terraced around its periphery and ornamented medially with numerous very fine irregular ridges.

Collum small and rather obtusely triangular laterad, the anterior marginal groove distinct as far as middle of ocellaria, not completely parallel to the edge, and not reaching caudal margin of the collum at the ends. Surface of collum smooth and flat, without punctations or striae. Anterior edge of pleurotergites of second segment turned up into a large marginal flange, the area behind it coarsely striate (fig. 6,*d*).

Body segments finely coriaceous under magnification, without punctations. Segmental sulcus distinct entirely around body, anterior portion of prozonite with fine transverse striae. Pores very small but distinctly in the mesozonite, below level of the lateral longitudinal suture. Lower sides with a few longitudinal ridges, not produced into marginal spines; ventrolateral areas of prozonites and mesozonites ornamented with very fine ridges forming elongate polygons that merge dorsally into the transverse striae.

Telson broad and bluntly angular, not concealing valves in dorsal aspect; the latter typical for the subfamily in appearance; preanal scale broadly transverse, entirely smooth and lacking modifications such as occur in *Centrelus kerrensis*.

Sternites subrectangular, only slightly narrowing caudad, with about six to eight fine transverse striae laterally turned caudad. Stigmata contained entirely with the sternal sclerite. Legs smooth and polished, the tarsal claw very long and slender, more than half as long as tarsal joint; ventral setal formula 1–1–2–2–2–6; tarsi with two or three small setae on caudal side and one on the cephalic.

First two leg pairs of the male reduced in size and strongly incrassate, especially the basal two joints. Tarsal claws of first three leg pairs very long, becoming shorter on the next pairs. Coxae of anterior legs not produced or lobed although membranous areas, possibly extrusible to some extent, can be detected when the legs are dry.

Sympleurite of seventh segment nearly parallel-sided and slender, the median suture visible. Gonopods (figure 6,*a*,*b*) with sternite of anterior pair slender, nearly straight across and, on the caudal side of the gonopods, not entirely fused to the coxite, a distal portion being free and somewhat projecting. Coxites somewhat crescentic in shape, in contact with the sternite, and arching mesially, separated by a small slender vinculum, apices of coxites set with areas of fine denticles. Telopodites quite small, with caudolaterally directed apices, the latter not or but slightly visible in anterior aspect. Posterior gonopod with very long and slender apodeme; distal elements not distinctly divided into coxite and telopodite, the caudal margin of the joint produced into a large thin lamina, drawn out distally into an acute hyaline angle.

Discussion: Variation: The number of segments in four specimens from the type locality ranges from 45 to 48; two males from Baylor County, Texas, have 44 each. However, four specimens from the vicinity of Abilene, Texas, have counts ranging from 48 to 52 and suggest that there may be an east-to-west decrease in segment number. In all of the material examined, the clypeal foveolae vary from 4–4 to 5–5. There is considerable variation in size, specimens from the western extremity of the range being smaller but otherwise similar to the larger eastern individuals.

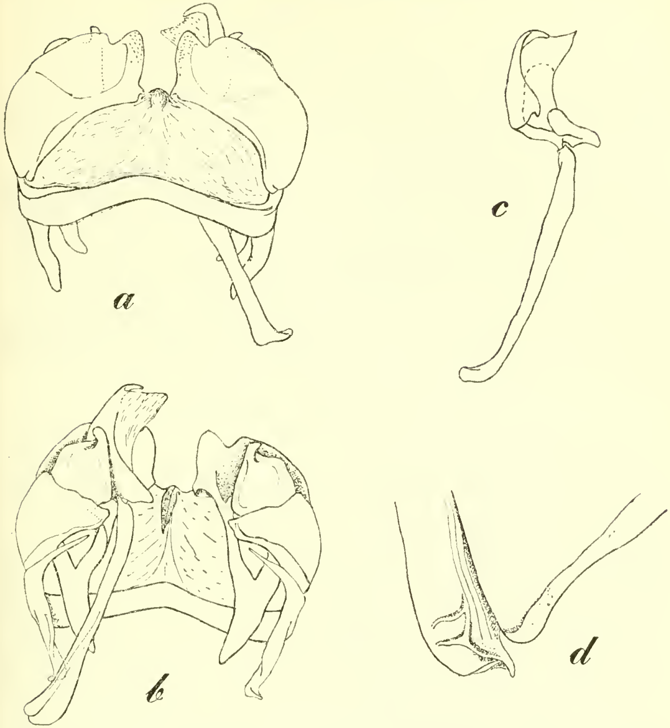

Figure 6.—*Comanchelus hubrichti*, new species, male paratype from Val Verde County, Texas: *a*, anterior gonopods and right posterior gonopod, cephalic aspect; *b*, same, caudal aspect; *c*, posterior gonopod, caudal aspect; *d*, lower end of collum and adjacent part of 2nd segment, left side.

Distribution: *Comanchelus hubrichti* is apparently rather widespread over much of western Texas despite having been taken at only a few localities. Material has been examined from the following localities:

Texas: Baylor County: 5 miles south of Seymour, April 20. 1947, K. P. Schmidt (Chicago Nat. Hist. Mus.). Dimmitt County: Carrizo Springs, October 16, 1954, Leslie Hubricht (R. L. Hoffman). Hays County: Southeast of San Marcos, May 3, 1955, Leslie Hubricht (R. L. Hoffman). Taylor County: 25 miles south of Abilene, March 18, 1948, H. S. Dybas (Chicago Nat. Hist. Mus.). Val Verde County: 3.3 miles northeast of Pandale, June 11, 1955, Leslie Hubricht (USNM).

Eurelinae of uncertain generic position

Eurelus mulaiki Chamberlin, 1943b, p. 147, figs. 7–11.

Holotype: Male, collection of R. V. Chamberlin, from north of Glencoe, Lincoln County, New Mexico, collected on May 31, 1941, by Stanley and Dorothea Mulaik.

Discussion: The drawings of the gonopods of this form are extremely diagrammatic and show little of specific importance; nor is it possible to determine to what genus the species should be referred. Possibly the closest relationships are with the species of *Comanchelus*, as suggested by the normal tarsal claws and small coxal lobes. Unfortunately, we have been unable to secure material for study.

Range: The species, having been reported in the original description from several localities in Lincoln and Torrance Counties, apparently enjoys a wide distribution in central New Mexico.

Atopetholinae, new subfamily

Species of this group are small- to moderate-sized atopetholids, averaging slightly smaller than the species of Eurelinae, which they superficially resemble. Owing to the scarcity of material and to the shortcomings of published descriptions, no satisfactory account of external structure can be essayed beyond an account of details in *Atopetholus angelus*, a member of the type genus. The antennae tend to be of considerable length, extending back to the second segment, and are therefore much longer than in the Eurelinae. In *Atopetholus* the collum is evenly acuminate toward the lateral ends, which in *Watichelus*, however, are bent somewhat caudoventrad. The body segments are smooth and polished, the ozopore opening in the mesozonites, and in *Atopetholus*, at least, the suture between prozonite and mesozonite is very poorly defined or invisible.

In the male, the claws of the anterior legs are not reduced in size, and the coxae are provided only with modest, low subtriangular lobes, which increase slightly in size from the third to seventh leg pair.

Male gonopods are rather similar in both of the genera, particularly the anterior pair. The sternite is slightly arched mesially, and is surmounted by a large subtriangular vinculum that widely separates the coxites, but that becomes hyaline and membranous proximally and is not continuously rigid with the sternite.

The coxites are moderate in size, their mesial corners produced distally as usual but to a lesser extent than normal for the family. The telopodites are large and flattened, the apex being broad and blunt, and in *Atopetholus*, at least, subtended on the caudal side by an additional acuminate process that projects caudad and slightly

laterad or else distinctly distad. The base of the telopodite is set off by a marginal rim which projects slightly out beyond the end of the coxite toward the opposite side.

The posterior gonopods tend to be quite simple, the coxite and telopodite merging into a broad consolidated subtriangular region with no remaining trace of a joint at the point of the union. No traces of a seminal groove have been detected, and nothing that might be considered a solenomerite. The end of the telopodite may be simple and laminate or strongly recurved, and a large subterminal branch is present in *Watichelus*.

There is some doubt attending our disposition of genera in this subfamily. The generic name *Orthichelus* has been proposed for species which differ only slightly from typical *Atopetholus*, and we have therefore united the two names largely on the basis of the "quality level" of degree of differentiation. Final resolution of the matter awaits the attention of someone able to collect material from numerous localities in southern California. The poorly known genera *Tidolus* and *Hesperolus* may prove to be referable to this subfamily when their type species are finally rediscovered and studied.

Genus *Atopetholus* Chamberlin

Atopetholus Chamberlin, 1918, p. 168.

Onychelus (not of Cook) Verhoeff, 1938, p. 274.—Chamberlin, 1949, p. 169 (in part).

Orthichelus Chamberlin and Hoffman, 1950, p. 7 (type species: *Onychelus phanus* Chamberlin).

Type species: *Atopetholus californicus* Chamberlin, by original designation.

Diagnosis: An atopetholid genus characterized by the occurrence of large accessory projections on the telopodite of the anterior gonopods just behind and below the apex of the joint. The absence of a subterminal projection on the caudal margin of the posterior gonopod distinguishes the genus from the related *Watichelus*. The lateral ends of the collum are nearly symmetrically acuminate, in contrast to their being bent caudally in *Watichelus*.

Discussion: The taxonomic history of the group of species assembled under this generic name has been unnecessarily complicated and confusing owing chiefly to the failure of both Cook and Chamberlin to document adequately the descriptions of some of their new forms. The difficulty began with the proposal of *Onychelus obustus* in 1904, when Cook briefly remarked that the posterior gonopods of the species are "concealed, simple, slender, falcate." No illustrations were given for the species, and its really diagnostic characters have remained unknown for almost half a century. In 1923 Chamberlin

described under the name *Onychelus nigrescens* an atopetholid from Coronado Island, Gulf of California, in which the gonopod was much like that described by Cook. His example was followed by Verhoeff (1938) in naming *O. michelbacheri* from southern California, and finally Chamberlin added another related species, *O. phanus*, from the same general area.

The history of *Atopetholus* developed simultaneously with but independently of that of *Onychelus*. Proposed in 1918, *Atopetholus* included species in which the posterior gonopod is slender and falcate, with a recurved tip, and in which the telopodite of the anterior gonopod is provided with an accessory process. Apparently Verhoeff was unaware of this paper for his knowledge of the name Atopetholidae seemed limited to its use as a heading in Chamberlin's 1923 contribution. He thereupon rejected it as a nomen nudum and proposed the new name Onychelidae, a name unfortunately based upon a milliped not even in the same subfamily with the true *Onychelus* of Cook. His species *Onychelus michelbacheri*, indifferently described and illustrated, appears to be a fairly typical form of *Atopetholus* in the sense here adopted.

Onychelus continued to be used for quite a variety of millipeds until 1949, when Chamberlin restricted it to *obustus*, *michelbacheri*, *phanus*, and *nigrescens* and proposed the new names *Gosichelus* and *Watichelus* for species that had been previously described as forms of *Onychelus*. At the same time, however, the long-lost type material of *O. obustus* was found among Cook's effects and returned to the U.S. National Museum. An examination of the gonopods showed at once that Cook's description was quite inaccurate, as the posterior elements are actually arcuate and distally bifid and both these and the anterior gonopods are totally different from those of the other three species mentioned above. Actually, two other millipeds had been described that are very close to *obustus*, although Chamberlin (misled by Cook's description) placed them in the new genus *Gosichelus*. This discovery led to the subsequent relegation of *Gosichelus* to the synonymy of *Onychelus* and the proposal (Chamberlin and Hoffman, 1950) of the new generic name *Orthichelus* to include *phanus*, *michelbacheri*, and *nigrescens*.

The question that we have had to consider is whether the variation in the posterior gonopod justifies retention of *Orthichelus* as a valid genus. Upon weighing all of the available information, we cannot find any support for this course. Whether or not the extreme tip of the gonopod is recurved to form a terminal hook appears to be a very weak basis for a generic name, particularly when all other characters appear to be the same in typical species of *Atopetholus* and *Orthichelus*. There seems to be some variation in the development of the terminal

hook, and, furthermore, the recent description of *Atopetholus barbaranus* states that the species differs from all others "in having the distal end of the posterior gonopods with its border straight, not rolled in or recurved."

For the present, at least, the most reasonable course seems to be the combination of the two names, with the recommendation that the question be reopened someday by an investigator having an abundance of material of all the species concerned.

Atopetholus angelus Chamberlin

FIGURES 2, 7

Atopetholus angelus Chamberlin, 1920, p. 101; 1953, p. 138.—Chamberlin and Hoffman, 1958, p. 155.

HOLOTYPE: Male, Mus. Comp. Zool., from Edendale suburb, Los Angeles, Los Angeles County, California, collected by Gordon Grant on December 30–31.

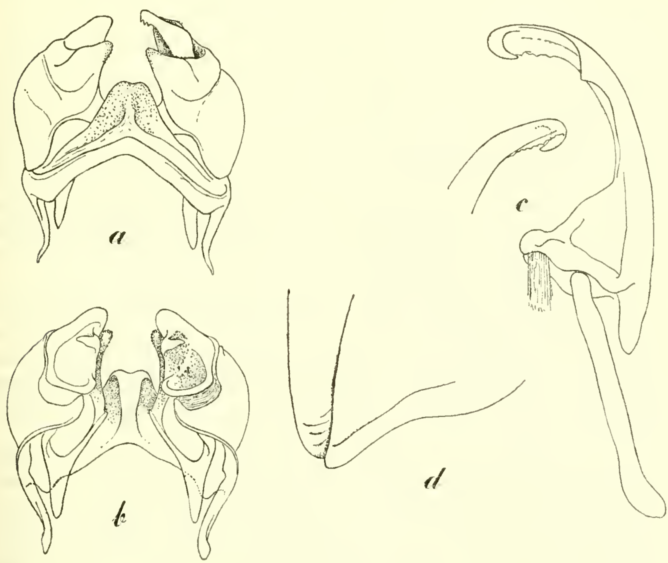

FIGURE 7.—*Atopetholus angelus* Chamberlin, male paratype from Los Angeles County, California: *a*, anterior gonopods, cephalic aspect; *b*, same, caudal aspect; *c*, left posterior gonopod in caudal aspect, with the terminal part shown from cephalic aspect; *d*, lower end of collum, left side.

Diagnosis: A large species of *Atopetholus* in which the accessory process of the anterior telopodite is rather small and directed caudolaterad instead of distad as in most other species, and in which the tip of the posterior gonopod is recurved proximad, the lower edge of the telopodite being subterminally serrate and the upper edge produced mesiad into an acute lobe at about the midlength.

Description (male paratype): Front of head smooth and polished, with several transverse (about 12) grooves between the antennae; genae smooth; labral teeth very low and broad, almost obliterated; labral pores 5–5; ocellaria nearly round, the intervening space almost four times the diameter of an ocellarium; antennae moderately long, extending back to second segment, the first 3 articles glabrous, second article longest, third through seventh gradually decreasing in size. Exposed surface of mandible flat and subcircular, with a distinct marginal ridge.

Collum smooth and polished, somewhat flattened dorsally; second tergite with about six shallow grooves on each side behind ends of collum, the pleural lobe merely depressed without a distinct anterior flared rim.

Body segments smooth and shining, with only one distinct transverse suture passing well behind the ozopore; the lower sides of tergites with small, poorly defined longitudinal striations. Last three segments strongly telescoped; telson very short and blunt, not concealing the anal valves in dorsal aspect, the valves evenly convex, smooth and polished, the preanal scale small and flat. Sternites trapezoidal, with about six to eight fine transverse ridges; adjacent surface of pleurites flat and smooth. Legs moderately long and slender, lengths of joints in order of decreasing length 6, 3, 2, 1, 4, 5; tarsal claw long and slender. Ventral setal formula: 1–1–3–3–3–6.

First two pairs of legs crassate, with a large robust claw; legs 3–7 normal in size and shape, their tarsal claws not reduced, the tarsi not depressed or modified. Coxal lobes subtriangular, moderate in size, increasing slightly from third to seventh; pleurites of seventh segment forming a high transverse crest, fused mesially and slightly overhanging caudally.

Male gonopods are discussed briefly with respect to general form and the musculature on page 107. In the lack of comparative material, it is difficult to single out what might be specifically diagnostic in the gonopod structure, although some presumably diagnostic features have been listed in the foregoing diagnosis of the species. The anterior sternite is rather massive and somewhat pitted over its surface, particularly the intercoxal vincular portion. The base of the posterior telopodite is produced proximally into an elongate lobe for the attachment of retractor muscle "6."

Color (from original description):

General color typically shining black with a narrow, typically ferruginous but sometimes nearly white, pale line along caudal border of each segment, the collum having an anterior ferruginous border as well. Legs from dark brown to fuscous or black.

Discussion: This species appears to be sympatric with *A. californicus*, both having been recorded by Chamberlin (1953) from Los Angeles. The following statement from the original description of *A. angelus* indicates a way of distinguishing males of the two species:

> Posterior apophysis of telopodite of anterior gonopods [of *angelus*] in ventral view longer and more slender [than in *californicus*], not expanded distally; the distomesial angle of telopodite more prominent, often meeting its mate in the middle line. Telopodite of posterior gonopods distally more strongly uncate.

The term "posterior apophysis" is referred to in this paper as the accessory process of the anterior telopodite.

Distribution: Known thus far only from Los Angeles County, California. It has been reported in the literature from Edendale suburb and from Reservoir Hill, both at Los Angeles. An additional collection has been studied consisting of a male with 40 segments from the San Juan Hills, 2 miles west of Spadra, Los Angeles County, California, collected in June–July 1943 by D. D. Davis (Chicago Nat. Hist. Mus.).

Atopetholus barbaranus Chamberlin

Atopetholus barbaranus Chamberlin, 1949, p. 168 (male holotype in the Chamberlin collection, from Orcutt, Santa Barbara County, California, date and collector not stipulated).

The original description states:

> The species may be readily distinguished from the others thus far known in having the distal end of the posterior gonopods with its posterior border straight, not rolled in or recurved. The two fingers of the anterior gonopods are characteristically long, slender, and divergent. The coxites of the anterior gonopods moderately extending beyond the sternite.

The holotype is said to have 48 segments, with a length of 40 mm. and a diameter of 5 mm. The following remark is also made: "Sternite of the third gonopod with the usual process." What is meant by this remark, we cannot imagine.

Atopetholus californicus Chamberlin

Atopetholus californicus Chamberlin, 1918, p. 168; 1940, p. 82, fig. F; 1953, p. 138 (male holotype, Mus. Comp. Zool., from Claremont, California, collected by W. A. Hilton).

This species is still poorly known and unfortunately the type specimen can no longer be found at the Museum of Comparative Zoology. The original description describes only the external features of the species; a subsequent reference contains a small sketch of a gonopod

telopodite, but this sketch is not useful for comparative purposes. As *Atopetholus californicus* is the type species of the genus, a good description of it is much to be desired.

Atopetholus carmelitus Chamberlin

Atopetholus carmelitus Chamberlin, 1940, p. 81, figs. C–E; 1941a, pp. 30–31, figs. 3, 4 (male holotype in the Chamberlin collection, from the Hastings Reservation, Monterrey County, California, collected on February 1, 1940, by J. M. Linsdale).

The description of this species includes the remark that it is one—

> much resembling *A. californicus* but differing in the gonopods of the male. An easily noted difference is in the telopodite of the anterior gonopods; this at the distal end is extended into a curved acute process which lies in front of the base of the digitiform process whereas in *californicus* the corresponding process is short and blunt with its distal margin concave.

Atopetholus fraternus Chamberlin

Atopetholus fraternus Chamberlin, 1918, p. 169 (male holotype, Mus. Comp. Zool. from Friant, Fresno County, California, collected by R. V. Chamberlin).

This species has not, apparently, been reported since its description, and the types cannot at present be found in the Museum of Comparative Zoology. According to the original diagnosis, *Atopetholus fraternus* is:

> Easily separable from the two preceding species [*A. californicus* and *A. parvus*] in the form of the male gonopods. The telopodite of the anterior gonopods is bent convexly forward at the side where it bears at the anterodistal angle a straight, simple, process additional to the caudally directed one arising from the distomesal edge behind, this feature at once separating it from the preceding species.

Atopetholus michelbacheri (Verhoeff), new combination

Onychelus michelbacheri Verhoeff, 1938, p. 276, figs. 1–3 (male holotype in the Verhoeff collection now in the Zoologische Staatsammlung, Munich, from Walker's Pass, Kern County, California, collected by A. E. Michelbacher).
Onychelus phanus Chamberlin, 1941b, p. 6, figs. 6, 7 (male holotype in the Chamberlin collection, from 6 miles west of Freeman, Kern County, California, collected on March 17, 1941, by Stanley and Dorothea Mulaik); 1949, p. 169.
Orthichelus phanus Chamberlin and Hoffman, 1950, p. 8.

Onychelus phanus was named insofar as one can deduce from its original description chiefly because of its being found in southern California whereas the admittedly very similar *O. michelbacheri* was stated to have come from "Nordcalifornien, am Walkerpass." [6]

[6] Actually, however, this information was elaborated on in a footnote stating "liegt der Walkerpass in einer sehr trockenen Gegend und befindet sich 100 Eng. Meilen nordlich von Los Angeles, etwa 50 Eng. Meilen südwestlich vom Death Valley Nat. Monument." These directions clearly refer to the Walker Pass that is located in the northeast corner of Kern County, about 4 or 5 miles west of the town of Freeman. There can be no doubt that the types of Verhoeff and Chamberlin actually came from the same locality and the major diagnostic character of *phanus* is thereby demolished.

The only structural difference stipulated for *phanus* was that the telopodite of the posterior gonopods appeared to be broader than illustrated for *michelbacheri*, but this difference is probably due to the fact that Chamberlin's drawing was made from a caudal aspect while Verhoeff's was made from the lateral aspect, which naturally shows the narrower dimension of the gonopod. Unless subsequent collections show that two sympatric sibling species occur at Walker's Pass and can be recognized by other constant differences, it seems that *phanus* must be considered a junior subjective synonym of *michelbacheri*.

***Atopetholus nigrescens* (Chamberlin), new combination**

Onychelus nigrescens Chamberlin, 1923, pp. 406, 407, fig. 46 (male holotype in the California Academy collection, from Coronado Island, Gulf of California, collected by J. C. Chamberlin).

The original account of this species is not as detailed as it should be, and the present generic allocation must be regarded as tentative.

***Atopetholus pearcei* Chamberlin**

Atopetholus pearcei Chamberlin, 1950, p. 6, fig. 3 (male holotype in the Chamberlin collection, from Oildale, Kern County, California, collected by W. M. Pearce on January 19, 1950).

The description of this species compares it only with *A. fraternus*, from which it differs in shape of the posterior gonopod—

> such as in the smaller, almost obliterated anterior marginal lobe and in the tooth at proximal end of the posterior marginal lobe, this being acute and directed nearly at right angles to the long axis of the telopodite instead of being blunt and directed proximad parallel with the axis.

Genus *Watichelus* Chamberlin

Watichelus Chamberlin, 1949, p. 169.—Loomis, 1949, p. 241.

Type species: *Onychelus smithi* Chamberlin, by original designation.

Diagnosis: An atopetholid genus characterized by the presence of a distinct mesially directed branch or process on the telopodite of the posterior gonopod, and by the absence of a secondary process from the telopodite of the anterior gonopods. In other respects the genus is quite similar to *Atopetholus*, so far as can be determined from published accounts. Loomis (1949) mentioned that the lateral ends of the collum tend to be bent caudoventrad in species of *Watichelus*, and this condition may also be found to be a diagnostic character when all the species of *Atopetholus* are inspected for this particular detail. In *A. angelus* at least (fig. 2,*d*), the end of the collum is nearly symmetrical and directed ventrad.

Discussion: The distribution of this genus appears to be centered around the Colorado Desert of southern California and the arid region of adjacent Baja California. Doubtless numerous species remain to be discovered. One interesting inference to be made from the recent contribution by Loomis is that several species may occur at a single locality, a form of sympatry apparently not developed in other atopetholid genera. Not having material for personal examination, we merely subjoin a list of the known species, most of which are well described and nicely illustrated in Loomis' paper.

Watichelus edentatus Loomis

Watichelus edentatus Loomis, 1949, p. 241, figs. 1, 2 (male holotype, USNM 2514, from between San Diego and El Centro, San Diego County, California, collected on January 29, 1921, by O. F. Cook).

Watichelus emarginatus Loomis

Watichelus emarginatus Loomis, 1949, p. 243, figs. 7, 8 (male holotype, USNM 2515, from 8 miles south of Tia Juana, Baja California, Mexico, collected on January 1, 1925, by O. F. Cook).

Watichelus cooki Loomis

Watichelus cooki Loomis, 1949, p. 243, figs. 5, 6 (male holotype, USNM 2516, from Descanso, Baja California, Mexico, collected on January 1, 1931, by O. F. Cook).

Watichelus parallelus Loomis

Watichelus parallelus Loomis, 1949, p. 244, figs. 9, 10 (male holotype, USNM 2513, from Chula Vista, San Diego County, California, collected in December 1921, by C. G. Marshall).

Watichelus robustus Loomis

Watichelus robustus Loomis, 1949, p. 241, figs. 3, 4 (male holotype, USNM 2512, from Chula Vista, San Diego County, California, collected on January 23, 1921, by O. F. Cook).

Watichelus smithi (Chamberlin)

Onychelus smithi Chamberlin, 1947b, p. 49, figs. 52, 53 (male holotype, Acad. Nat. Sci. Philadelphia 9971, from Murray Canyon, Colorado Desert, 3 miles north of Palm Springs, Riverside County, California, collected in November 1946 by Lloyd M. Smith).

Watichelus smithi Chamberlin, 1949, p. 169.—Loomis, 1949, p. 244.—Chamberlin and Hoffman, 1958, p. 159.

Atopetholinae of uncertain generic position

Atopetholus paroicus Chamberlin, 1941a, p. 7, fig. 5.

Holotype: Female, collection of R. V. Chamberlin, from Mountain Spring, San Diego County, California, collected on January 8, 1941, by Stanley and Dorothea Mulaik.

Discussion: This species is known only from females and may well be, as Loomis (1949) suggested, actually referable to the related genus *Watichelus*, which occurs in the same area. The lateral end of the collum is strongly bent caudoventrad. Final allocation must await the study of conspecific males from Mountain Spring.

Onychelinae, new subfamily

As presently known, this group consists of two small genera that occupy rather distant regions: *Onychelus* in southern California and adjacent Arizona, and *Saussurobolus* in the southern end of the Mexican Plateau. The diagnostic characters of the subfamily are set forth in the preceding key, to which may be added the general remarks that the group appears to be a rather disjunct one, particularly in the form of the anterior gonopods. Very little is known about the structural details of the Mexican species, but *Onychelus* at least appears to be modified for an arenaceous habitat because of having more and longer setae on the sides of the legs than the other known genera of the family—in effect a fringe that is conceivably an aid in locomotion under loose soil. The marginal setae of the anal valves are also longer and more closely set than in the other species.

In *Onychelus* the anterior legs of the males are provided with long slender claws, and the coxal lobes are but weakly produced. Unfortunately, nothing is known about the tarsal claws in the genus *Saussurobolus*, but the coxal lobes of the third leg pair in that genus are rather long and conspicuous. The similarity of the two genera is best noted by comparing the basal structure of the gonopods, particularly the distinctly incurved sternal apodemes. The sternite itself is much more strongly produced distad than in any other atopetholid genus, approximating the type characteristic of most Rhinocricidae. The apodemes of the posterior gonopods are short and strongly expanded distally in both genera, the telopodites taking the form of a falciform blade, longer and more slender in *Onychelus*.

The very great distance between the two regions inhabited by species of this subfamily indicates that the intervening area has not been explored for its milliped fauna and that a large number of onychelids surely remains to be discovered in northern and central Mexico. Partly on the basis of geographic probability, we refer the inadequately described *Arinolus zacatecus* (Chamberlin, 1947b) to this group of genera, although it is clear enough that the species is not a member of the Arinolinae.

Genus *Onychelus* Cook

Onychelus Cook, 1904, p. 67.

Gosichelus Chamberlin, 1949, p. 168 (type species: *Onychelus medolus* Chamberlin, by original designation).

TYPE SPECIES: *Onychelus obustus* Cook, by original designation and monotypy.

DIAGNOSIS: A group of small atopetholids characterized by the opening of the ozopores in the mesozonites; the extensive development of lateral macrosetae on the legs; the production of the anterior gonopod sternite into a median subtriangular projection nearly as long as the coxal apices; and the posterior gonopod having the coxal and telopodital elements distinct and separate but connected by a flexible articulation, the telopodite being slender, falciform, and distally notched or bifid in all the known forms.

DISCUSSION: The original diagnosis of this genus and its only included species was fairly detailed with respect to body form but virtually ignored the genitalia and provided no drawings of those structures. This neglect gave rise to a considerable volume of confusion, most of which has been outlined in the discussion of *Atopetholus* on page 134. When the type series of *O. obustus* was finally discovered and studied in 1949, it was found that Cook's reference to the form of the posterior gonopods was badly in error, and had misled Chamberlin into using the name *Onychelus* for a group of species that we have referred to *Atopetholus*. For several small Sonoran species that he had previously named in *Onychelus*, Chamberlin recently provided the name *Gosichelus*. But since the type of that generic name, *medolus* Chamberlin, has been found to be congeneric with *obustus*, we herewith establish the synonymy of the two, and hope that with the publication of the accompanying drawing the case of the enigmatic *Onychelus* has been brought to a close.

Onychelus obustus Cook

FIGURE 8

Onychelus obustus Cook, 1904, p. 68.—Chamberlin and Hoffman, 1958, p. 157.

HOLOTYPE: Male (and numerous paratypes), USNM 797, from the Colorado Desert, Riverside County, California, collected by C. R. Orcutt.

DIAGNOSIS: Differing from *O. jaegeri* and *O. medolus* by slight qualitative differences in the form of the male gonopods that may or may not be worthy of specific recognition. No tangible separation of these three entities can be made without reference to illustrations.

DESCRIPTION: From the original generic description the following is taken:

Segments with a distinct transverse constriction, the posterior subsegment distinctly thicker and more convex than the anterior; repugnatorial pores located in front of the constriction; pores followed on posterior subsegments by a very distinct longitudinal sulcus. . . .

Anterior legs of male with claws very large, as long as distal joint; first two pairs strongly crassate; legs 3 to 7 with coxae only slightly produced; second joints with a rounded prominence below distad; other joints normal.

From the original species description, the following is taken:

Length of male 38 mm., width 3.8 mm.; female 39 mm. by 4.2 mm.

Colors in alcohol black and dull yellow or clay-color. Segments in front of posterior suture dull black to below the pores; posterior zone reddish above, the ventral surface, legs, and antennae clay-color.

Clypeal foveolae five on each side; some distance above the foveolae two oblique rows of small irregular depressions, the rows converging upward.

First segment with a very distinctly raised anterior margin extending from the lateral corners to near the eyes where the limiting groove bends inward and is suddenly obliterated. The edge is concave along the raised margin, to accommodate the inflated angle of the head, and the lateral corner is rather pointed.

Segments nearly smooth above; in front of the constriction they are quite even, but the black surface does not shine. Behind they are abruptly thicker and distinctly covex; the surface shines though it is less even, being marked by indistinct and irregular longitudinal shallow grooves or depressions. The suture of the median line is marked by a fine sulcus, and that behind the pore is deep and distinct. The longitudinal grooves become more distinct below the pores, and pass gradually into the normal striations more than halfway down to the legs. Pleural sutures distinct but less so than the others. The surface of the anterior part of each segment below is ornamented with a delicate network which takes the place of the concentric striations.

Last segment very broadly and evenly rounded, the surface inflated and convex, both above and on the sides. Anal valves evenly convex, polished, and shining.

Gonopods of male as in figure 8,*a*,*b*. Sternite of the anterior gonopods strongly produced mesiad into a subtriangular distally notched process extending distad almost to the ends of the coxal apices. Proximal margin of sternite with a deep median notch; sternal apodemes long and slender, only slightly expanded distally, bent somewhat mesiad, imperceptibly fused with the caudal side of the coxite. The latter elongated and rather slender, the distal end spatulate and slightly concave on the caudal side, the coxal apodeme short and distinctly set off from the rest of the joint. Telopodite moderately large, flattened, its apical lobe recurved caudolaterad. Posterior gonopod with a stout short apodeme, the distal end strongly expanded (fig. 8*c*). Coxite composed of two pieces diverging from a common base; the telopodite attached by a movable joint, slender, arcuate, the caudal edge produced into a broad flange that distally is enlarged into a triangular lobe just before merging with the main body of the telopodite; extreme terminal end strongly recurved, bifid or with a small subapical dentation.

Discussion: Comparison of the drawings of this species with those published by Chamberlin for *Onychelus jaegeri* and *O. medolus* shows

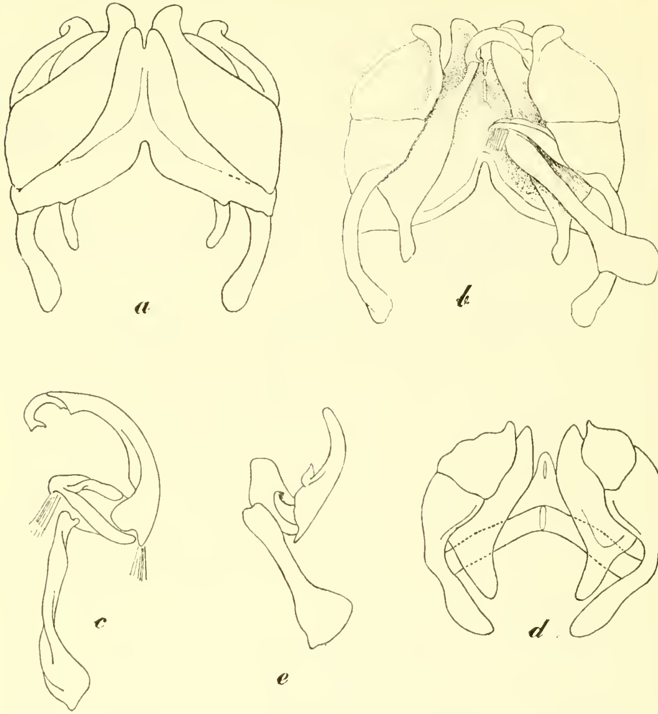

FIGURE 8.—*Onychelus obustus* Cook, male paratype from Riverside County, California: *a*, anterior gonopods, cephalic aspect; *b*, same, with left posterior gonopod in the gonocoel, caudal aspect; *c*, left posterior gonopod, caudal aspect. *Saussurobolus neglectus* Carl, male holotype from Cuernavaca, Mexico: *d*, anterior gonopods, caudal aspect; *e*, left posterior gonopod, caudal aspect (from Carl, 1919).

great similarity, and it seems entirely possible that the last two may not be specifically distinct from *O. obustus.* The final determination concerning this matter we leave to someone having the opportunity to study the genus in detail with large quantities of fresh material from numerous localities. At present, each of the nominal forms is known only from its type locality.

Onychelus medolus Chamberlin

Onychelus medolus Chamberlin, 1941a, p. 13, figs. 17, 18 (male holotype in the Chamberlin collection, from Olberg, Pinal County, Arizona, collected on December 27, 1940, by Stanley and Dorothea Mulaik).

Gosichelus medolus Chamberlin, 1949, p. 168

***Onychelus jaegeri* Chamberlin**

Onychelus jaegeri Chamberlin, 1947b, p. 50, figs. 54, 55 (male holotype, Acad. Nat. Sci. Philadelphia 9972, from the Indio Mudhills, 10 miles northeast of Palm Springs, Riverside County, California, collected in November 1946, by Smith and Jaeger).

Gosichelus jaegeri Chamberlin, 1949, p. 168.

Genus *Saussurobolus* Carl

Saussurobolus Carl, 1919, p. 389.

Type species: *Julus nietanus* Saussure, by original designation.

Diagnosis: A genus of small atopetholids most closely related to *Onychelus*, from which it differs in the presence of elongated coxal processes from the third legs of the males, in the much less produced sternite of the anterior gonopods, and in the shorter and simpler telopodite of the posterior gonopods.

Discussion: The type species of this genus was first described in *Julus*, and was later tentatively placed by Pocock (1910) in his genus *Cyclothyrophorus*. At that time only a single family of spiroboloids was recognized, and the first consideration of the species subsequent to Brolemann's 1914 essay on the classification of the order was given by Johann Carl, who restudied Saussure's types and established the genus *Saussurobolus*. Concerning its systematic position, he wrote (1919, p. 390):

> En dépit de l'absence, réele ou apparente, de l'ampoule et de la rainure séminales [of the posterior gonopod], je crois devoir classer *Saussurobolus* dans la familie des *Trigoniulidae*, où il occupe cependant une place isolée à cause de la structure du coxite, de la position et de la forme des poches trachéennes. Le nombre des fossettes labiales et la forme des valves anales constituent des caractères génériques de second ordre.

In his classification Attems (1926) accepted Carl's disposition of the genus, and placed it with other trigoniulid genera. To the best of our knowledge, *Saussurobolus* has not been subsequently mentioned in the literature.

There now seems to be little or no basis for considering the genus to be related to the highly specialized trigoniulids any more so than to any of the other spiroboloid families.

Occurring at the southern extremity of the Mexican Plateau, the species of *Saussurobolus* are the southernmost known representatives of the family, and may prove to be very numerous when that region has been thoroughly collected. Two species are known with assurance, and a third, originally described in *Arinolus*, appears to be congeneric with *S. nietanus* in structural details. Likewise known from southern Mexico, the species is here tentatively referred to the present genus.

***Saussurobolus nietanus* (Saussure)**

Julus nietanus Saussure, 1860, p. 565, pl. 5, fig. 33, *a–d* (male holotype, Mus. Hist. Nat. Genève, from Cuernavaca, Morelos, Mexico, collected by H. Saussure).
Spirobolus nietanus Saussure and Humbert, 1872, p. 89.
Cyclothyrophorus nietanus Pocock, 1910, p. 84.
Saussurobolus nietanus Carl, 1919, p. 390, fig. 16.

The following description is from Pocock (1910):

Small, cylindrical, with the seventh and eighth segments dilated. *Head* polished, punctured below, with 5+5 or 4+4 labral pores. *First tergal plate* with its antero-lateral border widely emarginate, its inferior angle very acute and extending slightly below the level of the second, which is not produced inferiorly below the level of the third. The remaining segments smooth and shining; the normal transverse sulcus complete and preceded by an additional complete sulcus; a well-marked longitudinal sulcus in front of and behind pore. The lateral sulci or striae strongly defined. *Anal segment* with tergal plate obtusely rounded, marked with a transverse rugulose groove; valves scarcely surpassing the tergal plate, strongly punctured, convex, and not compressed marginally; sternal plate rounded.

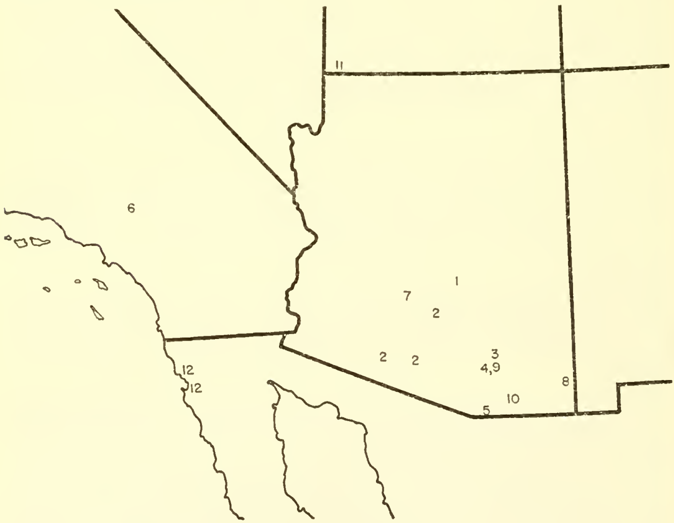

FIGURE 9.—Distribution of species of the subfamily Arinolinae in the southwestern United States and Baja California: 1, *Arinolus torynophor;* 2, *A. apachellus;* 3, *A. citrinus;* 4, *A. hopinus;* 5, *A. nogalanus;* 6, *A. latus;* 7, *A. pimus;* 8, *A. chiricahuanus;* 9, *A. hospes;* 10, *A*, *dentatus;* 11, *Piedolus utus;* 12, *Scobinomus serratus.*

♂. Sixth and seventh segments with their lower surfaces thickened and extending inferiorly. *Coxae of second leg* large; that of the third leg bearing a long, slender, pointed process; coxae of fourth, fifth, and sixth with a wide, somewhat triangular apophysis.

Number of segments 44. Length, 32 mm.

Saussurobolus neglectus Carl

Spirobolus nietanus Saussure and Humbert, 1872, p. 89.

Saussurobolus neglectus Carl, 1919, p. 391, figs. 17–22 (male holotype, Mus. Hist. Nat. Genève, from Cuernavaca, Morelos, Mexico).

Saussure and Humbert reported specimens from Cuernavaca that they thought to be conspecific with the species *nietanus*, which Saussure had previously described from the same locality. These specimens were, however, much larger than the original types, and with more segments, and on this basis Pocock suggested (1910) that perhaps two species were involved. This possibility was explored by Carl, who restudied the gonopods of the specimens concerned, and found differences in the posterior pair. He thereupon proposed the appropriate name *neglectus* for the larger species, and illustrated the genitalia of both in useful detail. Some of his drawings are introduced here for comparison with *Onychelus* (fig. 8,*d*,*e*).

Saussurobolus zacatecus (Chamberlin), new combination

Arinolus zacatecus Chamberlin, 1947b, p. 51, figs. 59, 60 (male holotype, Acad. Nat. Sci. Philadelphia 9974, from the Sierra Temperoso del Oro, Zacatecas, Mexico, collected in June, 1934, by H. A. Pilsbry).

Arinolinae, new subfamily

The four genera of this group include small-bodied atopetholids with numerous structural peculiarities. The body form is subparallel except for the enlarged sixth and seventh segments, and the slightly constricted segments just behind the collum. The telescoping of the caudal-most segments is limited to the last two or three, and there not to the extent found in the Eurelinae. The ocellaria are small and rounded, each with 25 to 40 ocelli, and are separated by a distance about equal to 2½ to 3 times the diameter of an ocellarium. In contrast to the antennae of the Eurelinae, those of the Arinolinae are considerably larger and longer, and reach back past the collum, in some cases as far back as the fourth segment. Although there are fewer body segments (from 35 to 45), the visible part of each segment is considerably more extensive than in larger members of the family, and preserves the normal ratio of body length to width. In the material studied for this character, there is a distinct remnant of a middorsal longitudinal suture on the metazonites. Transverse sutures

cannot be observed with accuracy, but it appears that the ozopores open in the metazonites, in contrast to most other genera of the family.

The anterior gonopods are curious in having the membranous tissue between sternite and coxites thrown into folds and rather heavily sclerotized; mesially this tissue is either produced in the form of a subtriangular vinculum or extends up between the coxae as two closely appressed lobes that superficially appear to be a single median process. The coxites appear to be subdivided by lateral sutures into two or more sclerites and have occasionally been so illustrated, but this condition is an illusion caused actually by rather pronounced grooving of the surface. The internal effect of this condition is to compartmentalize the inner surface of the coxites as far as the insertion and origin of the coxal muscles are concerned. Distally the coxites are drawn out into rather elongate and distinctly laminate processes of which mostly the narrow dimension is visible in anterior aspect, the elongations being much more pronounced than in other subfamilies of the Atopetholidae. On the caudal side, the sternal apodemes do not extend mesiad as far as usual, but the coxal apodemes are similar to those of other members of the family in having one edge continuous with the mesial anterior edge of the coxite and the other edge extending up to the mesially infolded caudal portion of the coxite. The telopodite is relatively large, and its distal end is likewise drawn out into a slender apex, which, in *Arinolus* at least, is rather laminate and bent distinctly caudolaterad and lies, when in situ, in the paramedian notch of the sympleurite of the seventh segment. Details on this point are unfortunately lacking for the other genera referred to here.

The coxites of the posterior gonopods are large and somewhat variable in shape. The telopodite is attached as usual at the extreme lateral end of a coxite, and the two conjointly form an acute angle with a visible joint at the apex. In *Arinolus* this joint seems to have some flexibility, but in *Scobinomus* and, presumably, *Tarascolus* as well, the two elements of the gonopod are extensively consolidated much as in *Atopetholus*, and the structure is more unified. The telopodite in all genera of this group is thin and flattened, with a basal peduncular portion that merges distally into an expanded laminate, subconchoidal portion subtended on the caudal margin by a solenomerite of variable size and shape. This latter structure is one of the diagnostic features of the Arinolinae, and ranges in appearance from a short, probably nonfunctional knob in some *Arinolus* to a long blade in *Piedolus* that exceeds the tip of the main branch and that is seen to carry a seminal groove. The posterior gonopod in *Scobinomus* is unusually short and heavy, chiefly because of a shortening of the telopodite peduncle and enlargement of the terminal calyx.

The distribution of this subfamily is confined to the Sonoran region of southwestern United States and the Mexican Plateau, centering around Arizona and southern California. Certainly a great number of species remain to be found not only in the areas mentioned but also in the States of New Mexico, Sonora, and Chihuahua, the mountains of which have never been explored for their milliped fauna (fig. 9).

At present we refer four genera to this subfamily, although with considerable reservation concerning the status of one of them. This matter is discussed at length in connection with the genus *Scobinomus*, and the diagnostic contrasts made in the second couplet of the following key to genera must be considered entirely provisional.

Key to the genera of the subfamily Arinolinae

1. Coxites of anterior gonopods produced mesially toward the sternite and separated by two elongate and closely appressed projections of the intersegmental membrane to form a ligulate process with little or no scleritization; posterior gonopods short and robust, the coxite and telopodite more or less consolidated and immovable 2

   Coxites of anterior gonopods not produced mesially toward the sternite, separated by a broadly triangular projection of sclerotized intersegmental membrane; posterior gonopods long and slender, the coxite and telopodite forming a flexible joint 3

2. Tergites with rudimentary scobinae and with the caudal margins bisinuate; ventrolateral striations of the metazonites produced beyond the edge of the segment into short acute spinules; ends of collum somewhat obliquely flared laterad and readily visible from above . . . . . . **Scobinomus** Loomis

   Tergites without scobinae and their caudal margins straight; ventrolateral striations of metazonites not produced into distinct spines; ends of collum not turned outward . . . . **Tarascolus** Chamberlin

3. Solenomerite of posterior gonopod very long, extending distad well beyond the laminate tip of the telopodite; coxal lobes of third leg pair of males elongated, extending back over the coxae of fourth legs; coxal apices of anterior gonopods only moderately produced distad . . **Piedolus** Chamberlin

   Solenomerite of posterior gonopod small and short, less than half as long as conchoidal portion of telopodite; coxal lobes of third legs of males small, not produced distally; coxal apices of anterior gonopods conspicuously produced and elongated . . . . **Arinolus** Chamberlin

Genus *Arinolus* Chamberlin

Arinolus Chamberlin, 1940, p. 81.—Loomis, 1950, p. 164.

TYPE SPECIES: *Arinolus torynophor* Chamberlin, by original designation.

DIAGNOSIS: Small- to moderate-sized atopetholids with the sixth and seventh segments noticeably enlarged; antennae rather slender and reaching back beyond the collum, the second article equaling or exceeding genal apex; males with tarsal claws of anterior legs of normal size or slightly enlarged, coxal lobes small and bluntly rounded; sympleurites of seventh segment strongly modified into a rather large

median lobe with a deep notch on either side; anterior gonopods with well developed triangular median projection of the sternite; posterior gonopods distally expanded into a conchoidal or strongly clavate region, with a short slender or spurlike solenomerite remnant.

Discussion: Although its first species was described by Cook in 1911, *Arinolus* was not recognized as a generic entity until 1940, when Chamberlin named the type species and diagnosed the genus as follows:

> Differing from *Tylobolus* and *Hiltonius* in having a free inner piece to the posterior gonopods as in *Spirobolus*. The posterior gonopods expanded at distal end into a spoonlike lamella. Anterior gonopods with both coxal plate and telopodite extended into processes at mesodistal corners. Anterior sternite proportionately very broad. Collum acutely narrowed below at each lateral end, margined in front. Claws of two first pairs of legs in the male conspicuously enlarged, those immediately following more slender and somewhat intermediate in length. Coxae of legs III to VII in the male bearing conspicuous, more or less lamelliform, processes. Anal valves not compressed, somewhat re-entrant at median margin.

Although this diagnosis is fairly accurate and inclusive, there is some doubt concerning what is implied by the term "free inner piece" of the posterior gonopod. The small spur that occurs on the telopodite in *Arinolus* is clearly not homologous with the long processes that originate from the base of the telopodite in species of the Spirobolidae. In general, the diagnosis of *Arinolus* would have been much more improved and manifestly much more meaningful had comparison been made with other atopetholids (particularly *Piedolus*) rather than with genera belonging to a different suborder.

Subsequent papers by Chamberlin (1940, 1941a, and 1947b) included the descriptions of several new species, so that the genus contained six nominal species by 1950. In that year appeared the first and only published discussion of taxonomy in the group, by H. F. Loomis, in which he dealt with the 1911 *Onychelus* species of Cook, and suggested the synonymy of several Chamberlin names. His proposals may be summarized as follows: *Arinolus apachellus* Chamberlin (1941a) = *A. torynophor* Chamberlin (1940); *Arinolus hopinus* Chamberlin (1941a) = *Onychelus hospes* Cook (1911); *Onychelus suturatus* Cook (1911) = *O. dentatus* Cook (1911).

The last two are in all probability correctly evaluated since the type localities of the species involved are the same, and since the forms of *Arinolus* are largely allopatric. There is, however, reason to challenge the synonymy of *A. apachellus* under *A. torynophor*, an association made chiefly on the basis of gonopod similarity. Loomis has kindly loaned the material upon which his opinion was based, a male topotype of *torynophor* and several specimens from the San Tan Mountains near Sacaton, Arizona, that he took to represent the

same species. On the basis of close comparison of this material, we find sufficient differences in body form as well as in gonopod structure to warrant recognition of *apachellus* as a valid form.

At the present, we consider 8 of the 11 names based on specimens of this genus to be valid, and an additional one is herewith proposed. The locality of the genus appears to be southern Arizona, with a single species known to be from southern California. So far none has been taken in New Mexico or in Arizona north of the Salt River, although this situation may be attributed to the general lack of collecting in the areas mentioned. There is a definite indication that at least several of the named forms are merely allopatric populations of a widespread species, but a satisfactory resolution of their status remains a problem for consideration when ample material has been accumulated for a good revision of the genus.

The species of *Arinolus* are among the smallest atopetholids, and are superficially similar under low magnification. In the limited material studied, however, we find that specific differences may be well marked when the animals are closely examined. The characters by which *torynophor* differs from the other two species treated here are almost generic in nature in comparison with the degree of specific differentiation manifested in other atopetholid groups.

The anterior gonopods are rather similar in all the known forms, but the posterior gonopods differ in various small qualitative ways and afford the most tangible recognition characters in the presently very imperfect state of our knowledge of the group. The division between coxite and telopodite is most conspicuous in this genus, there being a flexible joint at the apex of the angle that they form. Distally the telopodite is expanded into a suboval, laminate, somewhat conchoidal development from near the base of which there is a small styliform solenomerite remnant extending medially from one edge of the telopodite. In some forms there is an indication of a groove or duct passing along the base of the telopodite and up onto the base of the solenomerite remnant. This projection is rather clearly homologous with the solenomerite, which is usually quite well developed in the Trigoniulidae. In general, the posterior gonopods of *Arinolus* are the closest approach to the typical trigoniulid form, and exemplify a primitive condition from which other generic types have evolved by various patterns of simplification or elaboration. The anterior gonopods, however, depart considerably from the presumably primitive type characteristic of the Eurelinae.

One name, *Arinolus zacatecus* Chamberlin (1947b), was proposed for a specimen collected in Zacatecas, Mexico. As is clearly shown by the drawing of the anterior gonopod, this species has the sternite of the Onycheline type, and is obviously not congeneric with *A.*

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torynophor. We tentatively refer the species to *Saussurobolus*, a genus of the Onychelinae, with the two other species from the highlands of central Mexico.

The original description of *Arinolus torynophor* is not detailed with respect to the external characters, and the drawings of the gonopods are quite small. We take this opportunity to publish a thorough description of the species, and to provide a larger and more detailed illustration of a posterior gonopod. For the other two species treated here, we limit the description to points of difference from the type species.

Arinolus torynophor Chamberlin

Figure 10,*a*,*b*

Arinolus torynophor Chamberlin, 1940, p. 81, figs. A–C.—Loomis, 1950, p. 165.

Holotype: Male, collection of R. V. Chamberlin, from Fish Creek, 10 miles east of Tortilla Flat, Maricopa County, Arizona (date and collector unknown).

Diagnosis: A large arinolid, up to 40 mm. in length and 3.5 mm. in width in which the lateral ends of the collum are produced caudoventrad and extend below the level of second segment; the pleural lobe of the second segment without distinct anterior marginal ridge; sternites strongly trapezoidal in shape and with curved transverse striae; mandibular stipes excavated for reception of antennae, the ventral margin rounded but without marginal ridge; terminal division of telopodite of posterior gonopod large and elongate-oval, with a very small solenomerite.

Description (from topotype): Male, about 38 mm. long and 3.4 mm. in diameter, with 44 segments.

Color of preserved specimen light chestnut brown with the metazonites dark brown across dorsum; head, antennae, collum, legs, and anal valves yellowish brown.

Body slender and parallel sided back to last four or five segments, which abruptly decrease in size. Collum and second segment slightly wider than third to fifth, the sixth, and seventh segments also enlarged slightly over normal body dimension.

Head relatively large, width across mandibles as great as width of collum, front slightly convex, very smooth and polished without trace of transverse striations or genal grooves. Labral notch short and rather deep; clypeal groove sharply defined and almost continuous with the distinct occipital groove. Clypeal foveolae 4–4, irregularly shaped and spaced. Antennae relatively long, extending back to middle of second segment, the second article exceeding apex of gena. Articles in decreasing order of length: 2, 3, 4, 5, 6, 1, 7, all slightly compressed and becoming increasingly setose distally, the first three articles glabrous. Mandibular antennal depression very

shallow, striate, the ventral edge rounded and not distinctly margined. Ocellaria small, rounded, separated by a space about 2½–3 times the diameter of an ocellarium, with 25 ocelli in each.

Collum slightly wider than width of head, smooth and polished but with microscopic striations, its anterior lateral marginal ridge distinct and parellel sided throughout its length; the caudal edge emarginate near the end, which is produced distinctly caudoventrad and extends below the level of the second segment.

Pleural lobe of second segment without trace of anterior raised marginal ridge, the segment with four or five small ridges behind the end of the collum.

Body segments completely smooth, dorsally without trace of striae or punctations. Caudal third of segments slightly elevated; the lower surfaces of the metazonites provided with numerous short well defined ridges that do not extend caudad as spinules on the margin. No traces of a transverse segmental constriction remain across the dorsum, but the furrow is very pronounced near the sternite, as a deep depression dividing the segment into two subequal parts. Transverse sutures are not evident, but a lateral suture is distinct behind each ozopore. The last four or five segments decrease abruptly in diameter, but only the last two are telescoped, and these not to the extent found in the Eurelinae.

Anal segment rather small, its apex completely smooth and the margin broadly rounded or slightly truncate, the swollen anal valves conspicuously exposed in dorsal aspect. Valves smooth, strongly inflated, their mesial reentrant edges provided with a long series of short, stiff, interdigitating bristles. Preanal scale very broad and distally subtruncate, without tubercules or setae.

Sternites strongly trapezoidal, almost twice as wide in front as behind, with 6 to 10 transverse striations which curve forward mesially, and set off from the pleurites only by a fine suture. Anterior stigmal depression shared by both sternite and pleurite, posterior depression not set off by an oblique suture.

Legs relatively long and slender, reaching nearly to level of ozopores; the joints in order of decreasing length 3, 6, 2, 4, 5, 1. Ventral setae normally 1, 1, 2, 2, 2, 6, the tarsal joints with an accessory dorsolateral row of four or five long setae on the caudal side. Tarsal claw well developed, about a third to half the length of tarsus. First two pairs of legs strongly crassate and distinctly reduced in size, legs 3–7 normal in size and shape with long claws and low, apically rounded coxal lobes. Claws of legs 3–5 slightly longer than those following.

Sympleurite of seventh segment produced mesially into an anteriorly directed crassate lobe, without trace of median suture.

Anterior gonopods similar to those of *A. citrinus;* the posterior gonopods with the distal enlargement somewhat triangularly-ovoid in

caudal aspect, set off by a much deeper constriction than in the other known species of the genus (fig. 10,*a*).

Discussion: This species ranks among the largest forms of the genus and is very distinct from its smaller congeners in numerous structural characters. No contribution can be made at this time to the knowl-

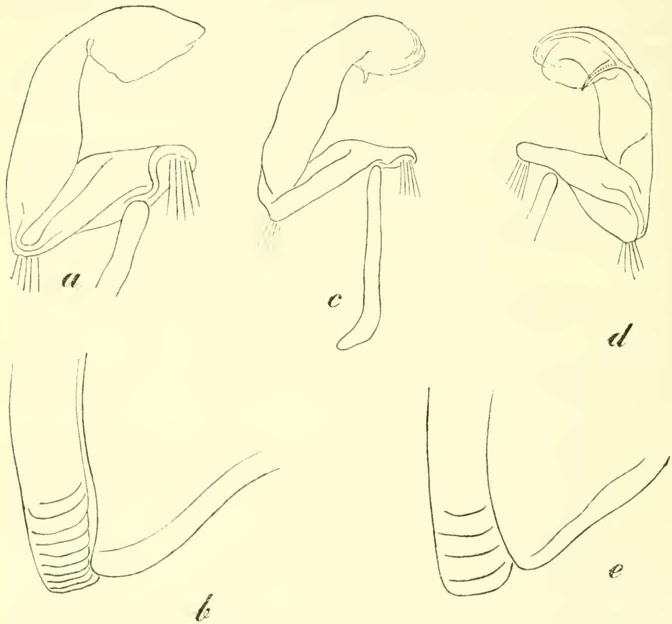

Figure 10.—*Arinolus torynophor*, male topotype from Fish Creek, Arizona: *a*, right posterior gonopod, caudal aspect; *b*, lower end of collum, left side. *Arinolus apachellus*, male specimen from Sacaton, Arizona: *c*, right posterior gonopod, caudal aspect; *d*, same, cephalomesial aspect; *e*, lower end of collum, left side.

edge of variability or of distribution as only two specimens are known, the holotype and a topotype, collected at Fish Creek by Loomis in 1924. Possibly *A. torynophor* will be eventually found to be endemic to the Superstition Mountains of eastern Arizona.

Arinolus apachellus Chamberlin

Figure 10,*c–e*

Arinolus apachellus Chamberlin, 1941a, p. 10, figs. 12–14.

Holotype: Male, collection of R. V. Chamberlin, from Covered Wells (now called Quijotoa), Pima County, Arizona, collected on

January 3, 1941, by Stanley and Dorothea Mulaik.

Diagnosis: A medium-sized species of *Arinolus*, differing from the preceeding species, with which it has been combined, in the shape of the collum, in having longer antennae, in the presence of a flared rim on the front edge of the pleural lobe of the second segment, and in the shape of the telopodite of the posterior gonopod, which likewise distinguishes it from all of the other species in which the male is known.

Description: Based upon a male (USNM, Loomis coll.) from Sacaton, Arizona, about 3.0 mm. in diameter, length undeterminable due to extensive breakage.

Front of head smooth and polished, without transverse wrinkles. Clypeal foveolae 3–3. Antennae rather long and slender, reaching back to the fourth segment, most of the articles more than twice as long as broad. Lower edge of mandibular stipe with a well defined marginal groove, the antennal depression smooth. Ocelli 28 on one side and 27 on the other.

Surface of collum smooth and polished, the anterior marginal ridge widest dorsally and becoming narrower toward the ends, the latter evenly subtriangular and not produced somewhat caudoventrad.

Pleural lobe of the second segment with a low but distinct raised rim along the anterior margin. Body segments without punctation or striation except on lower sides of the metazonites. The median longitudinal dorsal suture is evident on most segments.

The posterior gonopods (fig. 10,*c*,*d*) are of the typical *Arinolus* form, but differ from those of *A. torynophor* in having a larger solenomerite and a more evenly oval terminal calyx.

Distribution: This species was originally recorded from Quijotoa, 10 miles south of Ajo, and Congress Station, Arizona. In subsequently synonymizing *Arinolus apachellus* with the earlier name *A. torynophor,* Loomis gave several additional localities that may apply in part to this species, but we can be sure of only one. The male upon which the preceeding account is based, from the San Tan Mountains north of Sacaton, Pinal County, Arizona, provides the fourth definitely known locality for *apachellus.* The range appears to coincide with the plateau country of southwestern Arizona south of the Gila River valley, and probably extends as far east as Tucson. It is entirely probable that this species extends likewise into Mexico.

Arinolus citrinus, new species

Figure 11

Holotype: Male (and male and female paratypes), USNM 2508, from Bear Canyon, 6,000 ft., Mount Lemmon, Santa Catalina Mountains, Pima County, Arizona, collected March 19, 1953, by Henry and Alice Dietrich.

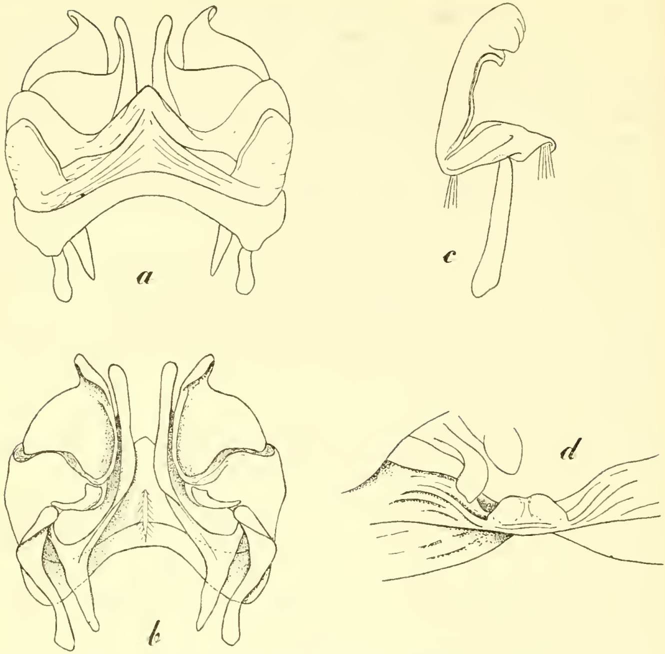

FIGURE 11.—*Arinolus citrinus*, new species, male paratype from Santa Catalina Mountains, Arizona: *a*, anterior gonopods, cephalic aspect; *b*, same, caudal aspect; *c*, left posterior gonopod, cephalic aspect; *d*, sympleurite of 8th segment, showing median process, with tips of gonopods of right side indicated.

DIAGNOSIS: A small arinolid characterized by the somewhat rudimentary calyx of the posterior gonopod, which is not set off by a constriction as in the other species treated here.

DESCRIPTION (FROM HOLOTYPE): Body small and parallel-sided except for the enlarged sixth and seventh and reduced third and fourth segments. Length undeterminable; maximum diameter about 2.8 mm.

Color uniform medium to dark brown, legs and antennae light brown.

Front of head smooth and convex, with several fine transverse striations; occipital groove very faint. Clypeal foveolae 4–3. Labral teeth much larger and better defined than in *A. torynophor*. Mandible without a true antennae groove, the outer surface merely depressed and smooth, the lower edge with a well defined marginal ridge.

Surface of collum smooth and polished with a few fine punctations; the lateral ends not produced caudoventrad and not extending below the level of second segment. Pleural lobe of second segment with a low but distinct anterior marginal rim. Pleurotergites generally smooth but with small scattered punctations, otherwise similar to those of *torynophor*.

Anal segment smooth with tiny punctations; anal valves with several small transverse grooves and striae.

Sternites more nearly rectangular than in *torynophor*, only slightly wider in front than behind.

Sympleurite of seventh segment (figure 11,*d*) strongly produced, with a distinct median notch and longitudinal depression.

Anterior gonopods (figure 11,*a*,*b*) with the sternite distinctly arched; shape of the coxites obscured by the heavily folded intersegmental membrane, which is produced mesially into a sort of "pseudosternite." Coxites impressed near the lateral margin by a deep vertical groove, giving the impression of distinct accessory lateral pieces. Apices of coxites strongly produced distad, and slightly curved laterally, the tips rounded. Telopodites visible in anterior aspect, their apices likewise drawn out and directed laterally, only slightly exceeding the level of the coxal projections. Posterior gonopods rather small and short, the telopodite in particular much less enlarged distally than normal for the genus (figure 11,*c*).

Discussion: Variation: The segment number in three males is 40, 41, and 42; in the female, 44. Clypeal foveolae range from 3–3 to 4–4. The ocelli in two males are 26–27 and 27–28; in the female, 37–39. There is some reason to suspect, therefore, that either the female belongs to a different species (despite having identical external characters), or that sexual dimorphism is more pronounced in this group than in the Eurelinae. This latter alternative is probably the correct one, as sexual differences are usually more pronounced in more specialized or evolutionarily advanced forms.

Distribution: Known only from the type locality, and possibly endemic to the Santa Catalina Mountains.

Arinolus hopinus Chamberlin

Arinolus hopinus Chamberlin, 1941a, p. 12, fig. 16 (male holotype in the Chamberlin collection, from 16 miles east of Tucson, Pima County, Arizona, collected on December 28, 1941, by Stanley and Dorothea Mulaik).

This name was placed by Loomis in the synonymy of *A. hospes* (Cook), a disposition that may be entirely correct. Yet until the Tucson region has been so thoroughly studied that it is certain only one *Arinolus* occurs there, we think it safer to avoid premature rejection of Chamberlin's name.

Arinolus nogalanus **Chamberlin**

Arinolus nogalanus Chamberlin, 1941a, p. 11, fig. 15 (male holotype in the Chamberlin collection, from Nogales, Santa Cruz County, Arizona, collected on December 30, 1941, by Stanley and Dorothea Mulaik).

Arinolus latus **Loomis**

Arinolus latus Loomis, 1953, p. 418, figs. 10–12 (male holotype, USNM 2090, from Antelope Valley, between Lancaster and Palmdale, Los Angeles County, California, collected on January 8, 1928, by O. F. Cook).

Arinolus pimus **Chamberlin**

Arinolus pimus Chamberlin, 1941a, p. 12 (female holotype in the Chamberlin collection, from Litchfield Park, Maricopa County, Arizona, collected on December 26, 1940, by Stanley and Dorothea Mulaik).

Arinolus chiricahuanus **Chamberlin**

Arinolus chiricahuanus Chamberlin, 1947b, p. 50, figs. 56–58 (male holotype, Acad. Nat. Sci. Philadelphia 9973, from White Tail Canyon, Chiricahua Mountains, Cochise County, Arizona, collected in 1906 by H. A. Pilsbry and S. H. Ferris).

Arinolus hospes **(Cook)**

Onychelus hospes Cook, 1911, p. 157 (holotype, a possibly immature female, USNM 803, from Tucson, Pima County, Arizona, collected on December 23, 1896, by H. G. Hubbard).
Arinolus hospes Loomis, 1950, p. 164.

Loomis suggested that *O. hospes* is a senior synonym of *A. hopinus* Chamberlin, which was also based on material from Tucson. In view of the external similarity of arinolines and the fact that two species can occur together, it seems best to keep the two names separate for the time being.

Arinolus dentatus **(Cook)**

Onychelus dentatus Cook, 1911, p. 158 (female holotype, USNM 804, from Fort Huachuca, Cochise County, Arizona, collected by T. E. Wilcox).
Onychelus suturatus Cook, 1911, p. 159 (female holotype, USNM 805, with the same type locality and collector as the preceding).
Arinolus dentatus Loomis, 1950, p. 164.

These two names are probably based upon the same species, the differences stipulated by Cook apparently due to either age or recent moulting by the type of *suturatus*.

Genus *Piedolus* Chamberlin

Piedolus Chamberlin, 1930, p. 117.

Type species: *Piedolus utus* Chamberlin, by original designation.

Diagnosis: An arinoline genus characterized chiefly by the solenomerite of the posterior gonopods, which is very long and slender,

exceeding the tip of the laminate tibiotarsus; by the elongated coxal lobes of the third legs of males; and by the coxal apices of the anterior gonopods, which are not produced distad nearly to the extent seen in *Arinolus*. In other characters the two genera appear to be very similar, although we have not been able to study material of *Piedolus*.

Discussion: Subsequent to its original description, *Piedolus* fell into complete obscurity to the extent that even its author failed to notice the name when subsequently erecting the closely related genus *Arinolus* in 1940 and when listing the known atopetholid genera in 1949. The original generic diagnosis compared the genus only with *Atopetholus;* aside from the differences noted, most of what is said applies to all atopetholids, and the most useful generic characters are to be found in the illustrations of the gonopods.

Piedolus utus Chamberlin

Piedolus utus Chamberlin, 1930, p. 118, 2 figs.

Holotype: Male, collection of R. V. Chamberlin, from St. George, Washington County, Utah, collected on April 3, 1929, by Lowell Woodbury.

Diagnosis: With the characters of the genus.

Description (data taken from the original description): Male 30 mm. long and 3.0 mm. in diameter, with 44 segments.

Color in general deep brown or almost black, the segments lighter beneath; head and anal segment uniform in color except a median pale line above clypeal incision; legs and antennae concolorous with body.

Clypeal foveolae 5–5.

Lateral ends of collum acute, anterior lateral edge concave adjacent to level of eye.

Sternite of anterior gonopod broad and slightly arched mesially, an accessory sclerite present at base of coxite on each side as in most forms of *Arinolus*, the coxites narrowing mesiad, and separated by what appears to be a vinculum formed from sclerotized membrane from the sternite. Details of the basal structure of both gonopods not shown but presumably as in *Arinolus*. Telopodite of posterior gonopod with the distal half set off by a constriction, becoming very broad, laminate, and subovoid in shape. Proximad of the constriction, on the caudal side, originates the long, slender, slightly sinuous solenomerite, which carries a visible groove.

Genus *Tarascolus* Chamberlin

Tarascolus Chamberlin, 1943a, p. 25.

Type species: *Tarascolus bolivari* Chamberlin, by original designation.

DIAGNOSIS: A genus of the Arinolinae with several very distinctive features, most outstanding of which is the shape of the anterior gonopods. These gonopods are in general similar to those of *Arinolus* except that the coxites are more approximate mesially and are separated by an elongate ligulate process formed by two appressed flattened folds of membranous intersegmental sclerotized tissue. The anterior face of the coxites is superficially divided by distinct lateral grooves as in *Arinolus*. The posterior gonopods are rather heavy and short, the telopodite distally modified into a thin membranous calyx, which is subtended by a long slender acuminate solenomerite. Body form slender and parallel except for the enlarged sixth and seventh segments. Collum less narrowed at sides than normal for the family, the anterior margin concave and with a slight marginal ridge, the caudal margin convex and with a few subterminal striae. Metazonites distinctly punctate. Claws of first two pairs of legs of males enlarged, those of following legs somewhat reduced in size. Coxal lobes of third leg pair prolonged and extending back over those of fourth, which are erect and subtriangular processes.

DISCUSSION: This genus was originally compared only with *Messicobolus* and *Eurelus*, neither of which are very closely related to it, while the obvious affinity with *Arinolus* was overlooked.

As presently treated, this genus is known only from two species collected at the southern end of the Mexican Plateau, from which region, however, a number of additional forms are to be expected. *Tarascolus* is discussed at greater length in connection with *Scobinomus*, the genus that follows below.

Tarascolus bolivari Chamberlin

Tarascolus bolivari Chamberlin, 1943a, p. 26, figs. 46–50 (male holotype in the Chamberlin collection, from Zitacuaro, 1,900 m., Michoacán, Mexico, collected on July 13, 1941, by C. Bolivar).

In Chamberlin's paper, figure 46 is stated to represent the right posterior gonopod of *Messicobolus totonacus*. However, this figure bears little resemblance to figure 45, which is also said to be of the posterior gonopod of the same species, and since the figure is almost identical with the corresponding gonopod of the closely related *Scobinomus serratus* (see fig. 12,*c*), it seems reasonable to assume that some mixup in numbering occurred and that figure 46 actually represents the posterior gonopod of *T. bolivari*, which is not otherwise illustrated although stated in the text description to be shown.

Tarascolus clarus Chamberlin

Tarascolus clarus Chamberlin, 1943a, p. 26, fig. 51 (male holotype in the Chamberlin collection, from Santa Rosa, Distrito Federal, Mexico, collected on June 28, 1942, by M. Cardenas).

Genus *Scobinomus* Loomis

Scobinomus Loomis, 1953, p. 420.

Type species: *Scobinomus serratus* Loomis, by original designation.

Diagnosis: A monotypic arinoline genus closely related to *Tarascolus*, from which it differs chiefly in the characters mentioned in the key to genera of the subfamily and discussed in the following paragraph.

Discussion: This generic name was proposed for a milliped that differed from all the atopetholids known to its author by the presence of scobinae on the body segments, as well as the presence of acute spinules on the lower edge of the metazonites. The validity of the name is not beyond challenge, however, for the following reasons. To begin with, the fact that scobinae are not mentioned in the diagnosis of *Tarascolus* does not mean that they are not present; in the paratypes of *S. serratus* examined, they are quite small and rudimentary and could easily be overlooked. Also, the published information on the species of *Tarascolus* is by no means as detailed as might be desired.

Second, there is some doubt that the presence or absence of rudimentary scobinae is a character of generic value. In the genus *Chersastus* of South Africa, they occur in some species but not in others, a condition duplicated in *Eurhinocricus* of Jamaica. Finally, in at least one known Jamaican rhinocricid, scobinae are present in one sex but not in the other. Assuming that scobinae do not occur in *Tarascolus*, the overall general similarity of its species with *S. serratus* is such as to indicate a very close relationship.

Finally, it is stated that "The gonopods bear some resemblence to those of *Tarascolus* Chamb., but the anteriorly exposed coxal joints of the posterior lobes and differently shaped inner [i.e., posterior] gonopods are distinctive characters in addition to the external ones." We believe that the difference in the posterior gonopods is more apparent than real, and is explainable in light of the fact that the gonopod of *Tarascolus bolivari* appears to have been credited to another species in the original drawings. Furthermore, the illustration given by Loomis shows this organ in anterior aspect, in contrast to the posterior views in Chamberlin's paper. The drawing that is here presented was made from a male paratype, the gonopod of which was removed and studied as a microscopic preparation. The drawing is so similar to figure 46 in Chamberlin's paper that the two objects might have come from the same species.

Scobinomus is retained here on the chance that all the characters taken in combination are actual differences, a matter that can be settled by future examination of typical material of *Tarascolus bolivari*.

Scobinomus serratus Loomis

Figure 12

Scobinomus serratus Loomis, 1953, p. 420, figs. 13–17.

Holotype: Male, USNM 2091, from 14 miles north of Ensenada, Baja California, Mexico, collected on January 7, 1925, by O. F. Cook.

Diagnosis: A small arinolid having the characters of the genus as discussed above, and specifically identifiable by the shape of the male gonopods.

Description: The detailed original description given by Loomis cannot be improved upon except as regards the formation of the gonopods. Study of a male paratype has provided the information following, and it should be mentioned at this point that the gonopods were cleaned of all adherent muscle tissue and mounted in glycerine to facilitate examination with considerable magnification. This technique, we feel, provides a more detailed picture of structure than can be gained from the study of untreated parts.

Anterior gonopods in this form (fig. 12*a*) are similar to those of the species of *Arinolus* in most respects. The sternite is nearly transverse, and is enlarged laterally near the origin of the sternal apodemes. On the caudal side the sternal extension reaches only about halfway to the mesial end of the coxite, a detail that is apparently constant in the subfamily. The coxites are large, and mesially are produced toward the sternite, a matter of structural necessity since there is no median vinculum to keep them separate. Each coxite is impressed on its anterior surface with a distinct oblique vertical groove that merges distally into several shorter perpendicular grooves.

Owing to the form of the coxites, there is little intersegmental membrane in the make-up of the anterior gonopods; what is present is largely in the form of a pair of ligulate processes extending distad between the coxites. In untreated material these processes are so closely appressed as to appear as a single structure. There is some membrane in the form of transverse folds along the upper edge of the sternite, the material forming an enlargement near the middle of the basal edge of each coxite. In caudal aspect (fig. 12,*b*) there is little of particular interest to be seen except for a small internally projecting process near the base of the sternal apodeme, a development not observed in any other species.

The posterior gonopod (fig. 12,*c*) as seen in caudal aspect has the usual long apodeme connected about a third of the length from the mesial end of the coxite. The latter takes the form of a slender rod, near the lateral end, enlarging mesially and then reflexed laterad and extending behind the telopodite. There is considerable consolidation of the gonopod, with little indication of the two distinct elements

joined at a flexible joint as in *Arinolus*. The telopodite is short and stout with a slender mesially projecting solenomerite, immediately distad of which the joint is flared into a distinct hyaline cuplike structure obviously homologous to the much smaller distal expansion of *Arinolus*, and for which the name *calyx* is suggested. No trace of a seminal groove could be detected.

The illustration of the posterior gonopod published by Loomis is made from the anterior aspect and presumably from a low magnification. Consequently, the solenomerite was not shown, and the similarity to the gonopod of *Tarascolus* was scarcely apparent.

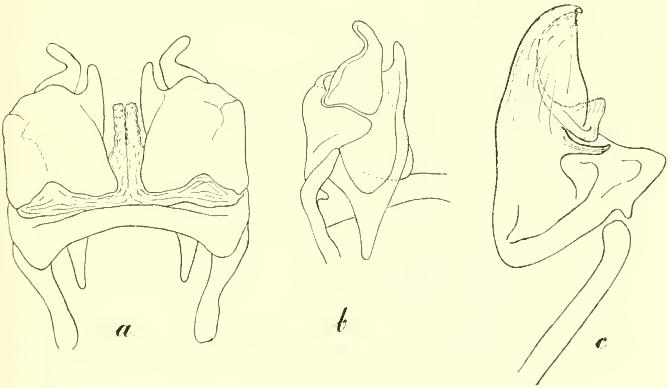

FIGURE 12.—*Scobinomus serratus* Loomis, male paratype from Ensenada, Baja California: *a*, anterior gonopods, cephalic aspect; *b*, right side of anterior gonopods, caudal aspect; *c*, left posterior gonopod, caudal aspect.

DISTRIBUTION: The two known localities for this species are on the Pacific coast of Baja California, not far south of the international boundary. It is a matter of some interest that this form, obviously a close relative of *Tarascolus* of the southern part of the Mexican Plateau, should occur in such a geographically isolated region. Possibly future collections in the mountains of Sonora and Sinaloa will disclose the presence of additional related forms and thus bridge the present gap. As it stands, this discontinuity is another small but valid reason for retaining *Scobinomus* as a separate genus, as such a magnitude of geographic isolation in Sonoran millipeds usually carries corresponding structural diversification.

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CENTIPEDES OF THE SMITHSONIAN-BREDIN EXPEDITIONS TO THE WEST INDIES

By Ralph E. Crabill, Jr.

Introduction

This report is based upon the centipedes collected in 1956 and 1958 by the Smithsonian-Bredin expeditions to the Lesser Antilles. From the islands in the Leeward and more northern part of the Windward groups, the members of the expeditions amassed sizeable numbers of insects and also some centipedes and millipedes, spiders, scorpions, pseudoscorpions, other arachnids, marine invertebrates, and fishes.

The centipedes collected by the expeditions are particularly valuable, first, because they contribute materially to our knowledge of the poorly known fauna inhabiting an area of great zoogeographical interest. Secondly, as we shall see, the presence of certain centipedes on these islands provides valuable evidence pertinent to the general problem of explaining the biotic affinities linking South America and Africa. Finally, the centipede collection includes four new species and a new genus—all of considerable interest for the characters they display and for their systematic affinities.

I should like to express my gratitude to J. F. G. Clarke of the Smithsonian Institution for capturing and carefully preserving these fragile specimens, and to Mr. and Mrs. J. Bruce Bredin, whose interest and generous support made the expeditions possible.

As fragmentary as it is, our knowledge of neotropical centipedes has seemed to some authorities to provide a measure of support for various theories that postulate a southern intercontinental land connection or continental driftings to explain a number of striking faunal and floral similarities between Africa and South America. Some authorities are impressed with the fact that certain genera, a few higher categories, and some species are known to occur either only in the New World tropics and Africa or in those regions and in Australia-New Zealand. For example, *Schendylurus*, represented in this paper by a new species, has apparently quite similar species in South America and Africa, especially in South Africa. *Scolopocryptops* (formerly *Otocryptops*) *ferruginea* (Linné), a widespread West Indian cryptopid, seems also common in Africa. For additional detailed information the reader is referred to Attems (1926 and 1928) and to a recent, informative account of Turk (1955).

Verhoeff (1941) appeared to subscribe to the idea of a direct southern land route of dispersal, whereas his contemporary, Attems (1928, p. 20), adopting what seems to me to be a less extreme viewpoint, suggested that: "To explain this distribution we need not recur to the theory of continental bridges [or] a Brazilo-African continent; the dispersal took place on the curve [from] South Africa [to] India, with a branching off on one side on the Sunda Archipelago to Australia, on the other side by Eastern Asia to America. Later on the genera died out again on the large part of this curve."

Turk (1955), impressed with the heterogeneity as well as with the farflung affinities of neotropical centipedes, proposed not one but several explanations to account for the different faunal components. Some genera, like *Schendylurus* and *Otocryptops* (=*Scolopocryptops*), he believed, are very old and represent an ancient adaptive radiation that took place possibly in Mesozoic times. This explanation is essentially Attems' viewpoint. A second component, typified by *Ribautia* and *Schizoribautia*, he believed may have arisen in the remote past and then spread from a neotropical center to West Africa across a connecting landbridge sometime during the Eocene-Miocene. Finally he recognized a third (p. 499) component whose distributions "follow somewhat suspiciously closely the direction of the Peru Current and South Equatorial Current," and did not discount the possibility that rafting transported if not the adults then conceivably the hardier eggs from one land mass to another.

I shall comment briefly upon each of these possibilities. Abundant distributional evidence supports the contention that extensive and probably rather regular exchange of chilopods occurred between Asia and North America. Traffic in both directions must have taken place during Tertiary times across the Bering Straits. There is no reason for

supposing that this traffic could not have begun long before those times. This dispersal route extended at each end perhaps best accounts for the presence in Africa, Asia, and South America of a number of the same or of evidently closely related scutigeromorph and possibly scolopendromorph genera (or suprageneric groups). Successful rafting, especially by Scutigeromorpha and probably also by Scolopendromorpha, is probably unlikely since these active, foraging surface-dwellers seem poorly adapted for prolonged exposure on the confines of floating debris. It is known that *Scutigera coleoptrata* succumbs rather quickly in salt water.

The idea of a direct land connection, at least since Cretaceous times, is seriously challenged today by geological evidence, though a land connection between the southern continents during and before the Triassic cannot at present be discounted entirely (Darlington, 1957, chap. 10). In any event I suspect that these southern faunal similarities can be better explained on other grounds, namely by artificial introduction, ancient dispersal on land, rafting, and wind transport (see Darlington, 1957, pp. 14–20).

Rafting is of particular interest from the standpoint of the schendylids described here, as we shall see. It used to be said of myriapods and amphibians that they could not tolerate salt water, but we know today that a number of centipedes, notably geophilid and schendylid Geophilomorpha, are able to withstand prolonged submersion. There are some genera whose members are reportedly quite normally encountered on beaches where they inhabit the sand, live in debris, or conceal themselves in mud or under wet stones; some of them have been found below the high tide mark. As a matter of fact, three of the present species, *Caritohallex minyrrhopus*, *Ballophilus riveroi*, and *Schendylurus virgingordae*, were collected in West Indian beach drift, and I have in my possession about a dozen specimens of *Pectiniunguis* (again, Schendylidae) that were discovered in seaweed on the beach of a Florida Key.

Cloudsley-Thompson (1948, pp. 149–152) comments on a number of littoral centipedes, some of which are evidently true halophiles. The cases of *Hydroschendyla submarina* (Grube), a schendylid, and *Strigamia* (formerly *Scolioplanes*) *maritima* (Leach) are especially instructive. *S. submarina*, known from the littoral of Scandanavia, France, England, the Mediterranean, and Bermuda, has in Bermuda been found living among mud and rocks and in honeycombed limestone below the mean high tide mark. Apparently this species subsists upon a variety of small marine animals including polychaete annelids. *H. maritima*, widespread on European coasts, has been found to be able to withstand as many as 30 hours of total submersion in sea water and from 70 to 80 hours in fresh water. Cloudsley-

Thompson cites many other valuable records and includes an extensive bibliography to which the reader is referred for additional information.

Since at least some geophilomorph centipedes can tolerate and may even accept as quite normal limited sea submersion, and since such inactive inhabitants of what might be called the crevice-cranny habitat would probably not be discomfited much or at all in the wood or under the bark of larger floating trees and bushes, it seems quite reasonable to imagine these centipedes capable of successful trans-Atlantic crossings by rafting. Many, perhaps the majority, would perish, but over the almost inconceivably long span of time and in the light of the untold millions of such voyages that were begun, many must have reached land and survived. This theory gains additional support from the fact that the Main Equatorial Current flows up the southwestern African coast to the Gulf of Guinea and across to Brazil, there dividing southward and northward, the latter division eventually passing into the Caribbean to merge with the Gulf Stream. The shortest distance between Africa and South America by this route is only about 2,000 miles and, tests have shown, takes about 12 weeks by rafting.

I suggest that during the immense stretches of time of the past some centipedes—they may very well have been Schendylidae—made the journey successfully, and that this explanation reasonably accounts for the presence in Africa and South America of many, but of course not all, congeneric or conspecific centipedes. Perhaps the remarkable distributions of *Schendylurus* and of some of the ballophilines were established, at least in part, in this manner.

Order Scolopendromorpha

Family Scolopendridae

Scolopendra subspinipes Leach. One adult, outskirts of Charlestown, Nevis, April 16, 1958. With the exception of the Mediterranean region, this large species is common to the tropics of the world. The nominate variant is apparently found widely in the New World tropics, probably as a result of repeated introductions.

Scolopendra alternans Leach. Two juveniles, Indigo Wells, Barbuda, April 26, 1958; one adult, Little Bay, Peter Island, March 30, 1958; one adult, L'eau Garnier, Dominica, March 13, 1956. Apparently restricted to the New World tropics, *alternans* is probably the most common *Scolopendra* in the Caribbean area. It has often been reported from southern peninsular Florida and the adjoining keys, and may be presumed to be established at least on the keys.

Scolopendra morsitans Linné. Four specimens, Codrington, Barbuda, April 27, 1956. This species is like *subspinipes* in being widespread in the world tropics, but unlike it in being common in the Midterranean perimeter.

Cormocephalus impressus Porat (?=*guildingii* Newport). Three specimens, Indigo Wells, Barbuda, April 26, 1958. The specimens key out to *impressus* in Attems' monograph (1930, p. 104), but are very likely referable to the earlier Newport name that Attems considered too poorly characterized for inclusion in his revision of the species.

Family Cryptopidae

Newportia longitarsis (Newport). One adult, Little Harbor, Jost van Dyke, April 1, 1958; one adult, Castle Bruce Junction, Dominica, March 24, 1956, in bromeliads. The specimens do not coincide exactly with the synthetic diagnosis presented by Attems (1930, p. 201), but seem sufficiently close to justify the present provisional allocation. The species is probably widespread and common in the Antilles, in Central America, and in northern South America where it has already been reported.

Scolopocryptops (formerly *Otocryptops*) *ferruginea* (Linné). Two adults, Castle Bruce, Dominica, March 24, 1956, in bromeliads. Originally described from Africa, the species' name has been applied to presumed conspecific forms in the New World tropics. Whatever its rightful name, the species is evidently quite common in Mexico, southern Central America, throughout the Antilles (and perhaps the West Indies in general), and in northern South America.

Order Geophilomorpha

Family Oryidae

Notiphilides maximiliani (Humbert and Saussure). Adult female, 87 pedal segments, adult male, 89 pedal segments, Soper's Hole, Tortola, March 31, 1958, in refuse. This species is apparently entirely neotropical; it is also widespread and common. It has been recorded from Mexico and Central America, from the Antilles, and from northern South America.

Orphnaeus brasilianus (Humbert and Saussure). One adult male with 71 pedal segments, Soper's Hole, Tortola, March 31, 1958, in refuse. This striking species is undoubtedly very widespread in the American tropics. It has been recorded from South America from about the Tropic of Capricorn northward in scattered localities, and from Central America. It may be widespread in the West Indies as well. There is some question regarding its specific distinctiveness

from the tropicopolitan *brevilabiatus* (Newport). For instance Attems regarded them as distinct (1929, p. 112), as did Kraus recently (1957, p. 368). On the other hand Bücherl, who has evidently seen many specimens referable to one or the other from Brazil, considers *brasilianus* a junior synonym of the senior Newport name (1941, p. 354).

Family Schendylidae

Subfamily Ballophilinae

Ballophilus riveroi Chamberlin?. One adult male with 55 pedal segments, Sea Cow Bay, Tortola, March 26, 1958, from Berlese siftings. The Tortola specimen agrees closely with Professor Chamberlin's original description of *riveroi* (1950, p. 157), but this description seems insufficiently detailed to permit a positive identification with my single specimen. If the two are actually conspecific and in turn congeneric with the Liberian-type species, *clavicornis* Cook, then the West Indian *riveroi*, represented in Puerto Rico and Tortola, and the Peruvian *peruanus* Verhoeff (1941, p. 70) represent the only species of the genus known in the Western Hemisphere at the present time, their congeners having been recorded from Africa and the Indo-Australian region.

Caritohallex, new genus

What little we know now of the Ballophilinae does not justify our speaking very confidently of intergeneric relationships. Indeed we may not even be dealing here with a single evolutionary, i.e., monophyletic, unit. Too little is understood of generic characterization and content, and too little is known of inter- and intra-specific variability. Certain so-called key or diagnostic characters may reasonably be suspected of having undergone evolutionary convergency. In this connection one might cite the ventral pore fields and coxopleural glands, perhaps even the prosternal sclerotic lines as well. Until a great deal more is known and understood, however, these possibilities, as well as the existing ballophiline system, should be regarded as conjectural and provisional.

It is unrealistic to speak here of relationships, though we can speak of resemblances, a concept that is quite different because it does not necessarily imply anything about descent and evolutionary affinity. The underlying key to genera is intended to accomplish no more than single out the various ballophiline genera as we now know them. Its groupings do not necessarily imply anything about community of descent. I am certain that its ultility will be short-lived. For the time being, however, it does synthesize what we believe may be meaningful.

With these thoughts in mind one may say that *Caritohallex* falls within that assemblage of genera whose members all lack typical, conspicuously clavate and geniculate antennae. At present all of these genera seem restricted to the New World tropics and subtropics: The majority occur in the Caribbean Islands, Central America, and northern South America, i.e., *Diplethmus, Taeniolinum, Koenethmus, Zygethmus, Leptynophilus, Carethmus*?, and *Caritohallex*. Within this group the new genus resembles most closely *Koenethmus* Chamberlin (1958, p. 59). In both, the antennae are not clavate or geniculate, prosternal sclerotic lines are totally absent, ventral pore fields are not circular or elliptical, and the ultimate leg tarsus consists of a single article. They differ quite significantly in the absence in *Caritohallex* of any discernible coxopleural pit, gland, or pore. Both the pit and the pore are said to be conspicuous in the Chamberlin genus. According to the presently recognized generic system of the subfamily, this distinction is clearly indicative of supraspecific rank.

Generic diagnosis: Antennae not clavate or attenuate; instead, they are filiform proximally and moniliform distally. Cephalic plate is subrotund, dorsally somewhat domed; prebasal plate well exposed. Clypeus much wider than long, with distinct, complete paraclypeal sutures (see note A, p. 189); with a band of coarser, more sclerotized areolation arching forward anterior to the labrum. Labrum membranous, centrally without teeth, laterally with weak membranous to weakly sclerotic teeth. Mandible with indistinctly divided dentate lamella, the row of simple hyaline teeth overlapping the dentate lamella. First maxillae with two pairs of lappets. Second maxillae medially broadly joined, not suturate; with postmaxillary sclerites (see note B, p. 189); telopodite claw pectinate, at least on ventral edge. Prosternum broad, completely bordered by bulging pleura; without subcondylic sclerotic (i.e., chitin) lines. Articles of prehensorial telopodite without denticles; ungula broad, serrulate. Poison gland extending into the prehensorial segment (see note C, p. 190). Tergites not bisulcate. Sternites with double pore fields divergent and linear, not raised. Ultimate pedal segment without discernible coxopleural glands, pits, or pores. Ultimate leg tarsus consisting of one article; pretarsus represented by a minute acicular bristle. Terminal pores absent.

Type-species: *Caritohallex minyrrhopus*, new species (original designation and monotypic).

The following key to the known ballophiline genera should further clarify the identity of *Caritohallex*:

Key to the Ballophiline Genera

1*a*. Ventral pore fields, at least on anterior third of body, in one or two subcentral areas varying approximately from circular to elliptical. Ultimate leg tarsus consisting of two articles. Antennae clavate or not. Prosternal sclerotic lines present or not 3

1*b*. Ventral pore fields, at least on anterior third of body, not in subcentral circular to elliptical areas, rather in posterior bands or diverging lines. Ultimate leg tarsus consisting of one article. Antennae distally not clavate. Prosternal sclerotic lines absent 2

2*a*. Each coxopleuron with one pit and associated pore. The more anterior ventral pore fields each appearing as two narrow transverse bands, on rear sternites becoming a single subcentral transverse band. (Venezuela.) **Koenethmus** Chamberlin

2*b*. Each coxopleuron without any pore or pit whatever, and each with no discernible gland. Ventral pore fields of anterior as well as of rear part of body each appearing as a pair of diverging strips or lines, and each consisting of a dozen or fewer pores. (Lesser Antilles.) **Caritohallex,** new genus

3*a*. Prosternum without or essentially without sclerotic lines. Ventral pore fields of the more anterior sternites each single 4

3*b*. Prosternum with complete or virtually complete sclerotic lines. Ventral pore fields of the more anterior sternites each single or double 5

4*a*. Antennae conspicuously clavate, more or less geniculate. (Africa, South America, Asia.) . . . . **Ballophilus** Cook

4*b*. Antennae not clavate, instead attenuate to a greater or lesser degree. (Antilles, Panama.) See note D, p. 191. **Taeniolinum** Pocock, **Leptynophilus** Chamberlin

5*a*. Anterior body pore fields each double. Antennae very slightly or not at all clavate 6

5*b*. Anterior body pore fields each single. Antennae varying from heavily clavate to filiform 7

6*a*. Each coxopleuron with one gland and associated pore. Ventral pore fields not raised. (Colombia.) . . . . **Zygethmus** Chamberlin

6*b*. Each coxopleuron with two glands and associated pores. Ventral pore fields on slight prominences. (Panama, Antilles, South America.) **Diplethmus** Cook

7*a*. Each coxopleuron with one gland which is heterogenous or homogenous. 8

7*b*. Each coxopleuron with two glands and associated pores, the glands heterogenous or homogenous 9

8*a*. Coxopleural gland composite, i.e., heterogenous, with numerous discernible inclusive glands. (Puerto Rico.) . . . . **Clavophilus** Chamberlin

8*b*. Coxopleural gland homogenous, i.e., without discernible inclusive glands. (Honduras.) . . . . **Tanophilus** Chamberlin

9*a*. Antennae conspicuously clavate and geniculate. Ventral pore fields of anterior sternites circular or else obviously transversely elliptical . . 10

9*b*. Antennae geniculate but not typically so or decidedly clavate. According to Chamberlin (1941, p. 139): "nearly uniform in diameter from second to eighth articles and then abruptly thickened at the ninth article and from there gradually attenuated to the distal end, the last six articles longer and thicker than the preceding ones." Ventral pore fields circular. (Venezuela.) . . . . **Carethmus** Chamberlin

10*a*. Ventral pore fields of anterior sternites each clearly transversely elliptical. (Seychelles, Madagascar, Japan, Pacific area, and Brazil.)
Thalthybius Attems

10*b*. Ventral pore fields of anterior sternites strictly circular. (South and Central America, Mexico, and North America.) . . . . **Ityphilus** Cook

***Caritohallex minyrrhopus*, new species**

Figures 1–6

Holotype, male, USNM 2520, British West Indies, Tortola, Sea Cow Bay, from Berlese sifting of beach debris, March 26, 1958, J. F. G. Clarke.

Total length 10 mm. Pedal segments 39. Color pale whitish yellow throughout; without the green or purplish subsurface pigmentation so characteristic of many ballophilines.

Antennae (see also note E, p. 192): Length, 0.82 mm. Proximal articles filiform, becoming distally moniliform. Proximal six or seven articles sparsely setose, thereafter becoming more setose. Ultimate article with a compact group of 8–10 hyaline spatulate setae on outer surface arising from a shallow depression; special sensory structures (sensilla) not detected on other articles.

Cephalic plate: Length along midline 0.32 mm., greatest width 0.32 mm. Subrotund, including prebasal plate somewhat longer than wide; posterior margin embayed to disclose prebasal plate; dorsal surface domed. Setae very sparse and short. Areolation relatively large and pronounced; without sutures or sulci.

Clypeus (see also note A, p. 189): Wider than long, bulging ventrally. Paraclypeal sutures bowed outward, each relatively wide; each side with a notch at position of transbuccal suture, the latter if present very obscure. Clypeal areas absent. Posteriorly with an arching band of more heavily sclerotized, more deeply colored areolation, which encloses a membranous nonareolate crescentic area continuous (or identical) with the atrophied labrum.

Labrum: Apparently continuous with crescentic membranous area of clypeus. Medial part without trace of teeth, entirely membranous. Each lateral part of the labral arch with about two weakly pigmented teeth, medial to the teeth about two flabby, membranous tooth-shaped lobes, barely distinguishable and almost totally transparent.

Mandible: Dentate lamella evidently very indistinctly divided into three parts, with seven or eight teeth; dentate lamella lying under (in situ posterior to) the row of simple hyaline teeth. Condyle promient, peglike.

First maxillae: Telopodite distinctly bipartite, with one seta; lappets approximately attaining end of telopodite, hyaline, virtually transparent, not squamulate. Coxosternum not suturate medially, anterior

margin deeply emarginate; its lappets not squamulate, nearly transparent, extremely broad basally.

Second maxillae (see also notes B and F, pp. 189, 193): Weakly areolate, nearly membranous, the two sides very broadly joined. Areolate postmaxillary sclerites present. Each pore opening surrounded by a weak sclerotic rim. Without typical setae, but with setiform sensory points as shown. Telopodite basal article bicondylic; claw pointed, spoon shaped, the ventral edge pectinate, the processes very long and delicate, nearly transparent; dorsal edge not discernibly pectinate, apparently smooth.

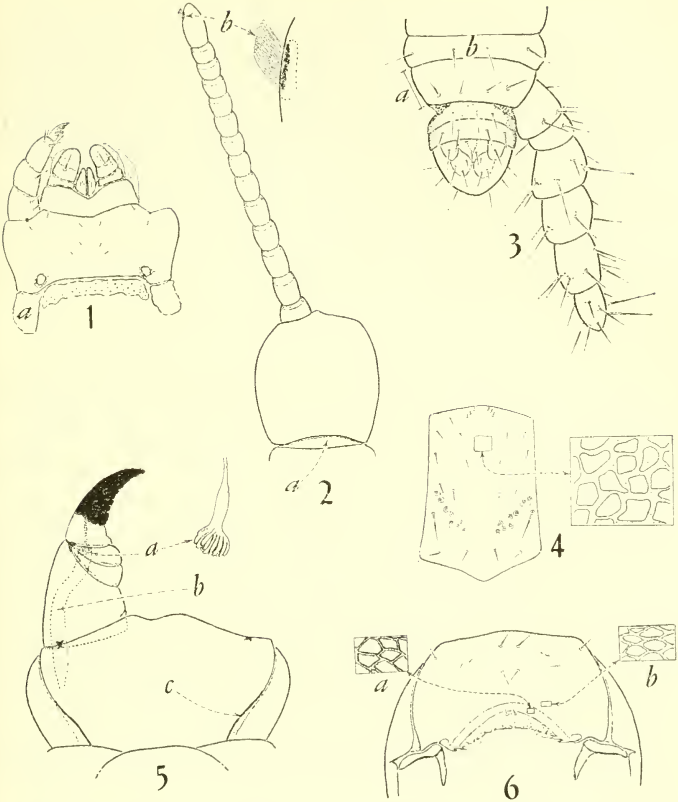
Prehensorial prosternum: Broad and short, margined by bulging pleura. Anteromedially weakly emarginate. Pleuroposternal sutures distinct, otherwise without sutures or apparent sulci.

Prehensorial telopodites (see also note C, p. 190): When closed, not attaining anterior head margin. No article with a denticle. Femuroid and tibioid together bulging toward body midline. Ungula broad and robust; with two distinct edges and a deep groove separating them, the ventral edge dissected to form coarse teeth, the teeth approximately subquadrate, short, five or six in number, limited to the basal two-thirds of blade. Poison calyx spherical, composed of bunched digitiform sclerotic processes. Poison calyx long and thin, terminating in the prehensorial segment at nearly one-half the distance to its posterior border.

Tergites: Apparently not sulcate; sparsely setose.

Sternites: Coarsely, prominently areolate, sparsely setose. Posterior margins, especially of more anterior sternites, extending backward in a broad low triangle; the first 10–15, at least, with a shallow midlongitudinal sulcus. Two pore fields on each sternite from and including the second through the penultimate, each field linear and diverging angularly from its bilateral counterpart, none raised, each consisting of a few small pores (e.g., 2nd=5+5, 4th=8+8, 34th=5+4).

Ultimate pedal segment: Pretergite bilaterally suturate, i.e., delineated from its pleurites on each side by a distinct longitudinal suture. Tergite much broader than long, posterior margin widely bowed backward. Presternite extensive, indistinctly sulcate medially. Sternite very wide and short, sides coverging posteriorly. Coxopleuron not greatly swollen, not larger than certain of the leg articles, its axis not directed posteriorly, rather posterolaterally, forming an acute angle with the long body axis; sparsely setose; without pores or pits, and with no discernible glands. Leg with five articles distal to the coxopleuron, the tarsus consisting of one article, the pretarsus represented by a minute acicular bristle (not visible at powers under



FIGURES 1–6.—*Caritohallex minyrrhopus*, new genus, new species, holotype: 1. First and second maxillae (ventral view, left telopodite deleted, all setae shown): *a*, Right postmaxillary sclerite. 2. Cephalic plate (dorsal view, setae deleted), left antenna, prebasal plate: *a*, Prebasal plate; *b*, patch of appressed, spatulate, hyaline setae on terminal article, in situ and enlarged. 3. Ultimate pedal and postpedal segments (ventral view, right leg deleted, all setae shown): *a*, Extent of flat, ventral surface of ultimate pedal sternite; *b*, broad presternite. 4. Sixth pedal sternite (ventral view, major setae shown, anterior end uppermost): Insert shows weak, loosely consolidated areolations of anterocentral area. 5. Prehensorial prosternum and right telopodite (ventral view, setae deleted): *a*, Poison calyx, in situ and enlarged; *b*, poison gland; *c*, slightly thickened border of lower part of pleuroprosternal suture. 6. Clypeus, labrum, buccae (ventral view, all setae shown): *a*, Coarse, deep, more strongly sclerotized areolation of arched clypeal band; *b*, contrasting smoother, shallower, weakly sclerotized areolation just anterior to arched band.

100×); leg swollen but evidently not to the degree encountered in some of the other genera; its setae are extremely long and straight.

Post pedal segments: Gonopods apparently unipartite, lobate, well separated. Pregenital sternite not obliquely excised as is usual in the male geophilomorph, instead rather bandlike as in the female. Male intromittent apparatus clearly disclosed lying dorsal and internal to and between the gonopods. Terminal pores absent.

Paratype, apparently female, same collection data. The only other specimen secured is a female (the intromittent apparatus characteristic of the male seems to be absent), 8 mm. long, with 43 pedal segments. The female agrees closely with the foregoing description of the male holotype.

Ityphilus idanus, new species

Figures 7–12

The two ballophiline genera for which the largest number of species has been recorded are *Ballophilus* and *Ityphilus*. The former is evidently dominent in the Old World tropics, but has at least two known neotropical species, and the latter seems to be represented only in the tropics and possibly subtropics of the New World.

The present species falls clearly within *Ityphilus*, as it is now defined. According to the published descriptions, *guianensis* Chamberlin seems most like *idanus*. They differ as follows: *I. guianensis:* Inner edge of prehensorial blade conspicuously serrulate; ventral pore fields extending to and present on penult pedal segment; posterior coxopleural pores larger than anterior pores. *I. idanus:* Edge of prehensorial blade smooth, not serrulate; ventral pore fields absent on last four pedal sternites; coxopleural pores all essentially equal in size.

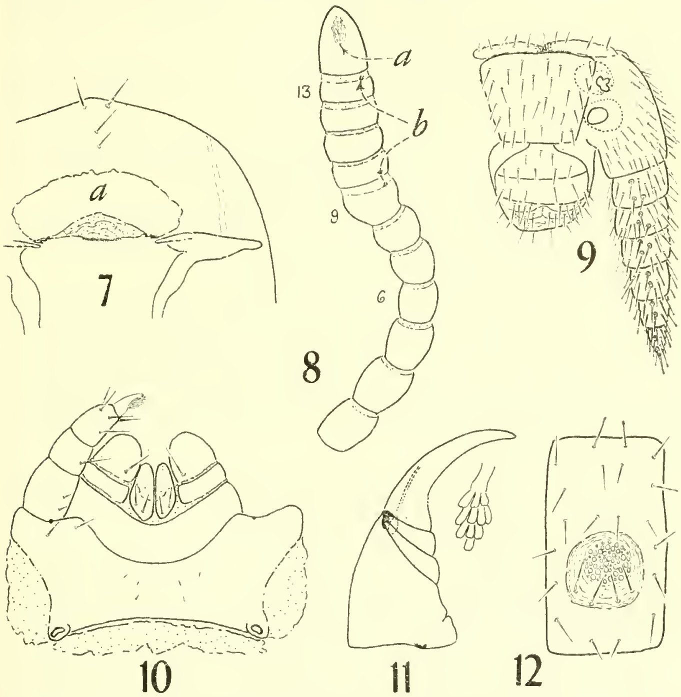
Holotype, female, USNM 2523, British West Indies, Barbuda, Danby Cave, April 28, 1958, J. F. G. Clarke, collector, in Berlese siftings.

Length 18 mm. Pedal segments 59. Body weakly, gradually attenuate anteriorly, the head suddenly enlarged giving the region just behind it a necklike appearance. Antennae, head, prehensors, and prosternum light yellowish brown; tergites, pleurites, sternites, legs with underlying fleshy parts dilute sordid green, the ventral pore fields dark sordid green.

Antennae (see notes E and G, pp. 192, 193): Length 0.6 mm. Distally clavate and geniculate. Articles 2–6 filiform, longer than wide, 7–9 cup-shaped and expanding distally, 10–14 very broad and short, as a group clavate, ventrally somewhat flattened and very densely, minutely setose (in contrast with sparser vestiture of rest of antenna). Ultimate article on each side with a slight pit containing about a

dozen hyaline, spatulate setae. Articles 9 and 13 each dorsodistally with two short thick, deeply colored sensory points (sensilla).

Cephalic plate: Length 0.34 mm., greatest width 0.38 mm. In outline nearly circular, dorsally swollen into a low dome. Setae very sparse and long. Deeply areolate and shining. Without sutures or sulci. Prebasal plate not apparent, evidently vestigial or absent.



FIGURES 7–12.—*Ityphilus idanus*, new species, holotype: 7. Clypeus and labrum (ventral view, all setae shown): *a*, Arching band of heavier, more deeply colored areolation enclosing strictly membranous region just anterior to degenerate labrum. 8. Right antenna (lateral aspect, the ventral surface is on left, all setae deleted, all but first two articles shown): *a*, Elliptical patch of hyaline spatulate setae on terminal article; *b*, peglike or pointlike sensilla on articles 9 and 13. 9. Ultimate pedal and postpedal segments (ventral view, right leg deleted): All setae of presternites, sternite, and ultimate leg shown. 10. First and second maxillae (ventral view, left telopodite deleted, all setae shown on right side): The membrane is indicated by stippling. 11. Right prehensorial telopodite (ventral view, all setae deleted): Poison calyx in situ and enlarged. 12. Sixth sternite (ventral view, all setae shown): Anterior end uppermost.

Clypeus (see also notes A and H, pp. 189, 193): As a whole swollen ventrally; much broader than long; paraclypeal sutures present but extremely vague, detected with difficulty; transbuccal sutures apparently absent. Without clypeal areas. Anterior to labral position a broad arc of more strongly sclerotized and deeply colored areolation, the remainder of the clypeus anterior to arc very weakly areolate; the part posterior to and enclosed by the arc membranous, not areolate. With two postantennal setae and two more setae just posterior to these; without posterior geminate setae.

Labrum: Centrally membranous, with a fringe of minute hairlike structures; each side of the labrum with one or two weak, poorly developed obscure teeth.

Mandible: Dentate lamella undivided, teeth blunt, well-separated, eight in number. With about 13 simple, hyaline teeth, their row overlapping two-thirds of the dentate lamella.

First maxillae: Telopodite distinctly bipartite, with one seta, without lappets. Coxosternum without medial suture or indication of division; coarsely areolate; without lappets.

Second maxillae (see also notes B and F, pp. 189, 193): Isthmus very broad, without suture or indication of division; areolation weak but uniform. Each coxosternite laterally membranous; entirely without postmaxillary sclerites; each pore opening somewhat thickened; with short laterally disposed setae and short sensory pegs medially. Telopodite basally bicondylic; apical claw spoon shaped, pointed, pectinate on each edge.

Prehensorial prosternum: Laterally broadly bordered by the swollen pleura. With prominent subcondylic sclerotic lines. Without sutures or apparent sulci; very sparsely setose.

Prehensorial telopodite (see also note C, p. 190): No article with a denticle. Ungula thin, acuminate, dilute in color, inner edge smooth. Poison calyx with a cluster of digitiform sclerotic appendages. Poison gland very long, extending into the prehensorial segment.

Tergites: Basal plate not covered by the cephalic, without sutures or sulci. Tergites 2 through the penultimate each very shallowly bisulcate. Setae relatively robust and dark. Surface coarsely areolate.

Sternites: Posteriorly without a broad triangular extension; on about the anterior third of the body each is slightly indented anteriorly. Setae long, robust, dark. Approximately the first 15 each with a short midlongitudinal depression. Pore fields on a circular, raised prominence, each with 4 long setae on the more anterior sternites, decreasing to 2 setae on the rear sternites; pore fields present on sternites 2 through 55, the last 4 pedal sternites without pore fields or discernible pores.

Ultimate pedal segment: Pretergite suturate on each side, delineated from its pleurites by pronounced longitudinal sutures. Tergite subtriangular, the rear margin narrowly rounded, laterally leaving much of coxopleura exposed from above. Presternite distinctly divided medially. Sternite sides straight, posteriorly truncate; greatest width somewhat greater than greatest length. Each coxopleuron with two pores and associated glands, the former exposed ventrally (not wholly covered by the sternite), the glands are of the homogenous type (i.e., lack inclusive smaller glands). Each leg with six articles distal to the coxopleuron; as a whole evenly attenuate, robust, swollen; pretarsus represented by a long, straight, setiform structure.

Postpedal segments: Gonopods consisting each of one article, medially imperfectly separated. Terminal pores absent.

Paratypes: One male, 13 mm., 55 pedal segments; one male, 9 mm., 55 pedal segments. See collection data for holotype. The two paratypes agree closely with the description of the holotype above.

Subfamily Schendylinae

Schendylurus virgingordae, new species

FIGURE 13–17

The new species belongs to that division of *Schendylurus* whose species possess: (1) Undivided pore fields, but only on the more anterior sternites; (2) a distinctly divided mandibular dentate lamella; (3) two pairs of well developed maxillary lappets. On the basis of published descriptions *S. virgingordae* seems most like the African *S. polypus* Attems and *S. australis* Silvestri, and the Peruvian *S. montivagus* Turk—if the latter possesses first maxillary lappets, a condition that is not clarified in Turk's original description. Aside from the question of lappets, Turk's species differs from *virgingordae* as follows: *S. montivagus:* Mandibular dentate lamella divided into four blocks; labrum with 37 teeth; ultimate pretarsus is evidently a distinct fleshy eminence; first two pedal sternites without pore fields; pore fields subelliptical. *S. virgingordae:* Mandibular dentate lamella divided into three blocks; labrum with less than 20 teeth; ultimate pedal pretarsus not tuberculate, represented only by an acicular bristle; second pedal sternite with a large pore field, the latter and succeeding pore fields distinctly subtriangular, each with a prominent posterior apex. *S. virgingordae* resembles *australis* rather closely except for the lack of first maxillary lappets in the African form. Attems' *polypus* differs from *virgingordae* in the former's abruptly narrowed ultimate pedal second tarsus, peculiarly shaped pore fields, number of pedal segments, mandibular divisions, and deeply embayed labrum.

Holotype, female, USNM 2522, British West Indies, Virgin Gorda, Prickly Pear Island, March 29, 1958, J. F. G. Clarke, collector, Berlese samplings of beach drift.

Body length 20 mm. Pedal segments 53. Color head prehensorial segment, and antennae pale yellow; pleura, tergites, sternites, and legs yellowish white to white or colorless.

Antennae (see also note E, p. 192): Length 216 mm. Filiform, each article much longer than wide (e.g., seventh, 1:w=40:24). First 7 articles less setose than 8–14. Ultimate article at tip on outside with a long groove in which are 10–12 hyaline, spatulate setae; without any other apparent special sensilla on this article or the other articles.

Cephalic plate: Length 0.75 mm., greatest width 0.57 mm. Sides slightly bowed outward, barely converging posteriorly; posterior margin straight. Dorsal setae few and small but lateral setae dense and short. Without a typical frontal suture. Anterior two-fifths of plate coarsely areolate, posterior portion except for two paramedian obsolete lines (appearing as sulci) smooth, the areolations more or less consolidated. Prebasal plate not apparent.

Clypeus (see also note A, p. 189): Paraclypeal sutures prominent; transbuccal sutures apparently absent. Without clypeal areas, without area of areolate consolidation except at extreme corners of labrum. Setae relatively short, thick, straight, dark. Each bucca shortly densely setose as shown.

Labrum: Evenly slightly embayed; medially separated from clypeus by a narrow membranous strip. Teeth all strong, dark; medial 6 apically blunt and flanked by more pointed teeth, the first kind merging almost imperceptibly into the other, the whole labral edge with 17–18 teeth.

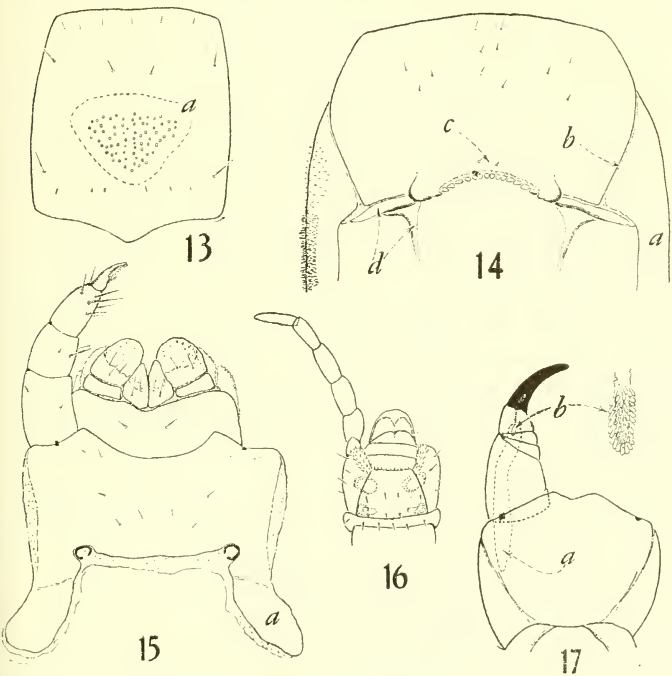
Mandible: Dentate lamella in three distinct, well separated blocks, each with well separated, pointed teeth, right 3–3–2, left 3–3–3. The simple row of hyaline teeth not overlapping the dentate lamella.

First maxillae: Telopodite distinctly bipartite, each with two or three setae. Coxosternum without medial suture; with only two setae; lappets vague, short, their surfaces subsquamulate, rather broad.

Second maxillae: Medially wide, without indication of division. With prominent postmaxillary sclerites completely fused with coxosternites. Pore opening slightly raised and sclerotized. Telopodite basal article bicondylic. Claw long, pointed, spoon shaped, each edge pectinate, the teeth of the ventral edge short, of dorsal edge long and hyaline.

Prehensorial prosternum: Anteriorly broadly diastemate but not denticulate. With a shallow midlongitudinal sulcus very regularly areolate. Each pleuroprosternal suture margined for half its length by a slight ridge (an abortive chitin or sclerotic line?).

Prehensorial telopodite (see also note C, p. 190): Failing to surpass front margin of head. No article with distinct denticles, though tarsungula with broad, rounded, slightly more sclerotized, light colored, very low eminence. Ungular inner edge perfectly smooth, not serrulate. Poison calyx elongate, its digitiform appendices relatively short. Poison gland thin and very long, passing out of prehensor well into prehensorial segment.



FIGURES 13–17.—*Schendylurus virgingordae*, new species, holotype: 13. Sixth pedal sternite (ventral view, anterior end uppermost, major setae shown): *a*, Dashed line indicating extent of smoothly, weakly areolate area around pore field; remainder is more coarsely, deeply areolate. 14. Clypeus, labrum, buccae (ventral view, all setae shown except on left bucca): *a*, Left bucca; *b*, left paraclypeal suture; *c*, posterior geminate setae; *d*, right fultura (*Komandibulares* Gerüst). 15. First and second maxillae (ventral view, left telopodite deleted, all setae shown): *a*, Left postmaxillary sclerite fused to left coxosternite. 16. Ultimate pedal and postpedal segments, right leg deleted. All setae of ultimate pedal presternite, sternite and of coxopleuron shown; others deleted. 17. Prehensorial prosternum and right telopodite (ventral view, all setae deleted): *a*, End of poison gland extending back into prehensorial segment; *b*, poison calyx in situ and enlarged.

Tergites: Basal plate slightly narrowing anteriorly, sides straight; not suturate or sulcate. Remaining tergites (except ultimate pedal) distinctly bisulcate. Very sparsely setose.

Sternites: Excluding ultimate pedal sternite each sternite very sparsely setose; each coarsely areolate except for area of smoother areolation surrounding each pore field. On anterior third of body each sternite posteriorly extended in a broad low triangle, the extension interlocking with intersternite and succeeding sternite. Pore fields single, subcentral, subtriangular, from sternite 2 through 20–22, the following sternites without pore fields and apparently without pores.

Ultimate pedal segment: Pretergite distinctly suturate laterally, thereby delineated from its pleurites. Tergite very broad, the greatest width greater than the greatest length; sides slightly incurved, posterior edge straight and about two-thirds the width of the anterior edge; exposing all but the anterior quarter of each coxopleuron from above; with a few very long setae. Presternite medially vaguely suturate, fused laterally with pleurites. Sternite broadly trapezoidal, sides slightly curving and convergent; posteriorly broadly truncate. Each coxopleuron moderately swollen; laterally with a few very long setae, ventroposterior surface with a dense vestiture of short setae; glands homogenous, two per coxopleuron, posterior pores and glands somewhat larger than the anterior. Legs each with six articles distal to coxopleuron, tarsus having two articles, each with a few very long setae in circlets; prefemur, femur, and tibia ventrally with subdense short setae concentrated about as on coxopleuron; pretarsus represented only by a minute acicular bristle about one-eighth as long as the largest neighboring setae.

Postpedal segments: Gonopods broad, medially fused, each apparently of one segment. Terminal pores absent.

Family Geophilidae

Subfamily Chilenophilinae

Lestophilus bredini, new species

Figures 18–24

All the species of *Lestophilus* known to date occur in Mexico and the two Antillean Islands Hispaniola and Tortola. Further collection is likely to disclose the presence both of described and of new congeners throughout much of the West Indies, as well as in Central America, and possibly in northern South America.

Unlike some of the supraspecific groupings of circum-Caribbean chilenophilines, *Lestophilus* seems quite consistent internally. Its few species share a convincing combination of apparently homologous characters, the most useful of which appear to be the following:

(1) First maxillae with long lappets. (2) Second maxillae with pronounced statuminia (note I, p.194), a poreopening being medial to the statuminia. (3) Second maxillary coxosternites joined by a rather broad but flimsy, membranous, medially very weakly areolate isthmus. There is no medial, dark, well sclerotized, knoblike anterior projection (the medial chitinous projection of Chamberlin) as there is in *Nesidiphilus;* nor is there encountered the thin, rather blisterlike isthmus of the more northern *Arctogeophilus.* (4) Postmaxillary sclerites are very small, strictly posterior in position. In certain other genera, such as Chamberlin's *Nesidiphilus* and *Suturodes,* the sclerites are broad and extend well up to or toward the poreopening. (5) Labrum tripartite, the midpiece not at all overlapped by or dorsoposterior to the sidepieces. (6) Ultimate tarsus of two articles. (7) Ultimate pretarsus reportedly absent (Chamberlin, 1915, p. 523) but probably, as in *bredini,* represented in some or in all by a minute, terminal, acicular bristle or point.

The new species differs strikingly from all others in its possession on each of the more anterior body sternites of a single, undivided, roughly diamond-shaped, subcentral pore field. In all others this pore field assumes the shape of a transverse band. *L. bredini* seems most like *L. haitiensis* Chamberlin; each has a pedal number in the high fifties and a serrulate prehensorial blade. The difference in pore fields shape (diamond-shaped to subtriangular in *bredini* but bandlike in *haitiensis*) should serve to separate the two quite readily.

Holotype: Female, USNM 2521, British West Indies, Tortola, Sea Cow Bay, March 26, 1958, J. F. G. Clarke, collector, Berlese samples of beach drift.

Length 21 mm. Pedal segments 59. Color of head, antennae, prehensorial segment light brownish yellow; pleurites, legs, sternites, tergites very pale yellowish to translucent or colorless.

Antennae: Length 2.7 mm. Each article much longer than wide; the whole essentially filiform. Basal six articles each with two distinct circlets of long setae, otherwise very sparsely setose; remaining articles each with progressively shorter but more numerous setae. Ultimate article about 30 percent longer than the penultimate; the ultimate subapically with 2 shallow elongate depressions on opposing sides, each depression containing spatulate hyaline setae, 90° from each and at the same level an elongate patch of 8–15 hyaline spatulate setae (i.e., with 4 patches of setae in all, each 90° from the next).

Cephalic plate: Length 0.75 mm., greatest width 0.48 mm. Elongate, sides subparallel; anteriorly and posteriorly narrowed. Sparsely setose, with a few very long, conspicuous fringing setae. Frontal sulcus appears (as seen by transmitted light) as a curved strip of much coarser, more translucent areolation; with two prominent

paramedian sulci extending forward to the frontal sulcus. Prebasal plate not apparent.

Clypeus (see also notes A and H, pp. 189, 193): Paraclypeal sutures pronounced and complete; clypeus somewhat wider than long. Each bucca anteriorly traversed by a distinct, oblique transbuccal suture. With two clypeal areas, each very small and subcircular, contiguous with the alveoli of the most anterior setae, and containing minute sclerotic fragments (and pores?). Otherwise clypeus uniformly, coarsely areolate, without smooth areas. All setae as shown, short and robust, deeply colored; anteriorly with four setae; posterior geminate setae about one-third the distance from labrum to anterior clypeal margin.

Labrum: Distinctly tripartite; separated from clypeus by a thin membranous strip. Midpiece deeply colored; with six strong teeth. Each sidepiece with a series of long acicular hyaline fimbriae on its medial half. Each fultura well sclerotized and large.

Prehensorial prosternum: Somewhat longer than wide; sides parallel; anteriorly medially not diastemate, with two short denticular projections. With a very shallow midlongitudinal depression. Surface smoothly areolate; with eight very long setae, surface uniformly clothed with numerous minute, short sensory points (minute, short setae). Pleuroprosternal sutures complete anteriorly; sclerotic (chitin) lines abortive, in essence absent.

Prosternal telopodite (see also note C, p. 190): When closed extending well beyond cephalic frontal margin. Trochanteroprefemur with a large dark, distomesal denticle, the article conspicuously excavated just below denticle. Femuroid and tibioid without denticles. Tarsungular denticle slightly smaller than those of basal article, the end somewhat deflected, thumb shaped. Ungula falciform, robust, dark, evenly gradually curved; proximal two-thirds of its blade coarsely serrulate. Poison calyx short, broad, subcordiform in outline, its

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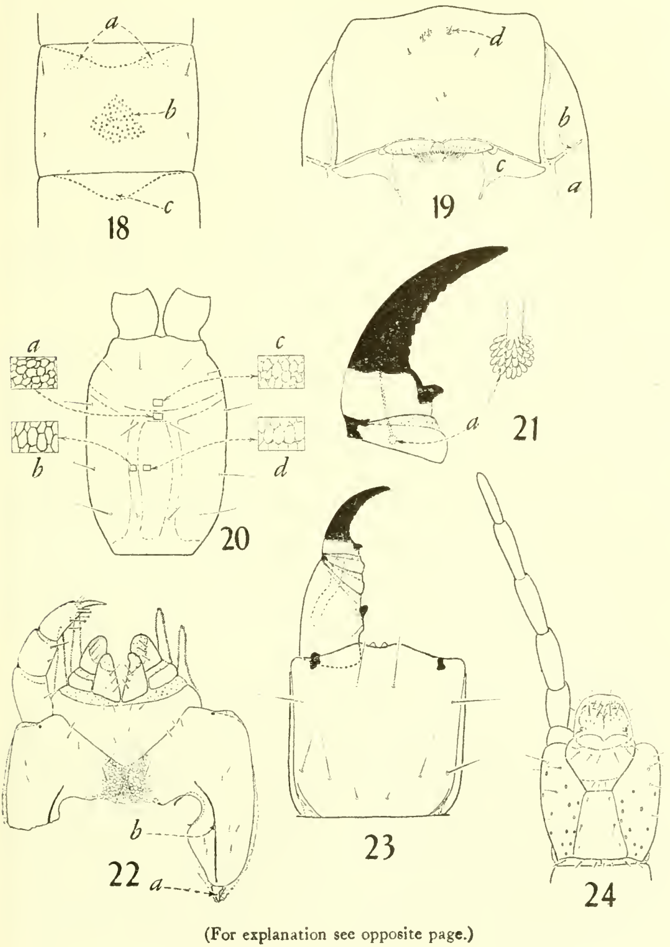
FIGURES 18–24.—*Lestophilus bredini*, new species, holotype: 18. Sixth sternite (ventral view, anterior end uppermost, major setae shown): *a*, Anterior bilateral (paired) pore fields; *b*, diamond-shaped subcentral pore field; *c*, broad triangular extension (metasternite) of sixth sternite. 19. Clypeus, labrum bucca (ventral view, all setae shown): *a*, Left bucca; *b*, transbuccal suture; *c*, left fultura (*Komandibulares* Gerüst); *d*, tiny clypeal area just anterior to seta. 20. Cephalic plate (dorsal view, major setae shown): *a*, Coarse, deep areolation of frontal sulcus; *b*, coarse, deep areolation of right paramedian suture; *c*, smoother, shallower areolation of frontal plate; *d*, smoother, shallower areolation of area between paramedian cephalic sulci. 21. Right tarsungula and right tibioid (ventral view, setae deleted): *a*, Poison calyx, in situ and enlarged. 22. First and second maxillae (ventral view, all setae shown): *a*, Minute, postmaxillary sclerite; *b*, left statumen. 23. Prehensorial prosternum and telopodite (ventral view): All major prosternal setae shown; setae of telopodite deleted. 24. Ultimate pedal and postpedal segments, left leg (ventral view): Setae of leg deleted; all others shown.

digitiform appendices numerous and individually well delineated. Poison gland long and thin, deflected outward; its lower end reaching to level of trochanteroprefemoral excavation, not extending into the prehensorial segment.

Mandible: Of the usual geophiloid form; with about 20 simple hyaline teeth, none strongly sclerotized; condyle well developed.



(For explanation see opposite page.)

First maxillae: Telopodites distinctly bipartite, each telopodite with three setae; with an extremely long and conspicuously squamulate, thin, acuminate lappet. Medial projection subtriangular, with three setae. Coxosternum without medial division, sparsely setose; its lappets extremely long, acuminate, thin, squamulate.

Second maxillae (see also notes B, I, F, pp. 189, 193, 194): Isthmus very weak, markedly areolate and membranous, the two coxosternites appearing (though not actually) separated. Each coxosternite anteroposteriorly relatively short; each with a small postmaxillary sclerite at the posterior angle. Each statumen strongly sclerotic, dark, arching ectal to and partly around its associated pore, the pore relatively large, opening widely medially. Coxosternital setae as shown. Telopodite first article bicondylic; inner surface of article basally swollen. No article with sclerotic projections or other appurtenances. Apical claw very long and thin.

Tergites, except ultimate pedal: Basal plate not bisulcate; slightly overlapped by posterior edge of cephalic plate. Pedal tergites markedly bisulcate, sparsely setose, the lateral margins of each with one very long seta.

Sternites, except ultimate pedal: Very sparsely setose, the setae short; faintly areolate; smooth, shining. Sternites of about the anterior third of the body each with a broad, unconsolidated and membranous (and areolate) posterior triangular extension. Each sternite except the first with a deep midlongitudinal sulcus, the sulcus becoming shallower on posterior sternites. Pore fields of 2 kinds: central or subcentral, on sternites 2 through 56; the pore fields on anterior third of body diamond shaped to subtriangular, their apices forward, thereafter becoming progressively wider and longer, more elliptical (the axes anteroposterior) and extending toward the rear border of the mesosternite; anterior paired pore fields on sternites 2 through at least 30, apparently absent on rear third of body, the pore fields extremely vague, their pores minute and pale, hence readily overlooked.

Ultimate pedal segment: Pretergite without lateral sutures, i.e., not demarcated from its pleurites. Tergite with sides weakly converging to the broad, truncate posterior margin, exposing dorsolateral parts of each coxopleuron; sparsely setose. Sternite trapezoidal, sides and rear margin straight; much longer than wide. Presternite medially vaguely suturate; fused on each side without demarcation from pleurites. Coxopleura each with about 20 (left 22, right 19) small pores; moderately swollen, extending forward at least to penultimate pedal segment, sparsely setose; without special lobes or ridges. Ultimate leg long and thin, with six articles distal to coxopleuron, the tarsus consisting of two articles, the pretarsus represented by a short,

thick acicular bristle, the bristle not setiform; each article of leg clothed with a small number of long pale setae.

Postpedal segments: Gonopods flat, broad, membranous, fused and indented medially, without sutures, apparently unipartite. Terminal pores present, distinct.

Notes

NOTE A, PARACLYPEAL SUTURES AND BUCCAE: Heretofore ignored in systematic discussions are what I term here the "paraclypeal sutures." When present and fully developed, they delineate the clypeus laterally; arising in the antennal sockets, they pass laterally and then posteriorly to end usually just ectal to the outer end of each labral sidepiece. They have been observed in various states of development and configuration in numerous geophilomorph genera; in some they appear to be absent, probably following degeneration. For example, in *Ityphilus idanus* they are extremely vague, whereas in *Schendylurus virgingordae* they are prominent. In general their presence or absence, their degree of development, and their shape and route promise to be useful as diagnostic characters.

The paraclypeal sutures, when present, separate the clypeus on each side from the deflected, ventral extensions of the dorsal cephalic plate. In other words, these ventrally deflected surfaces represent the continuations of each side of the cephalic capsule. They have been termed by many authors the cephalic pleura; however, their morphological identity is by no means so clear. Consequently it seems both premature and misleading to homologize each with a segmental pleuron. Therefore, I propose that the term "bucca" (cheek, pl. "buccae") be applied to them instead. Bucca is descriptive without having basic morphological implications. Each bucca, then, is that ventrally deflected part of the cephalic capsule that attaches posteriorly to the maxillae and that is anteriorly continuous with the clypeus from which it is often demarcated by a paraclypeal suture.

The bucca is sometimes traversed just posterior to the rear limit of the clypeus by an oblique suture, here designated the transbuccal suture. When present, this suture usually begins in the vicinity of the rear terminus of the associated paraclypeal suture, and then passes laterally or anterolaterally to terminate on the lateral edge of the bucca. In some genera the transbuccal suture seems to be continuous with the dorsally lying frontal suture. A transbuccal suture has been found to be present in many Geophilomorpha and absent in many others. Its origin and termination, degree of development, and configuration seem useful as classificatory devices, especially at supraspecific levels.

NOTE B, POSTMAXILLARY SCLERITES: In many schendylid and geophilid (sensu lato) centipedes, authors have recognized and made

extensive systematic use of some sclerites lying just posterior or posteromedial to the second maxillary coxosternites. By Ribaut, Broelemann, Attems, and others they have been termed the maxillary pleurites. Their shape, position, and degree of development and their presence or absence have distinct systematic significance. They seem to represent, at least in part, variously sclerotized portions of the membrane that connects the maxillae with the prehensorial segment lying to the rear. They are probably not parts of the primitive second maxillae at all, though there is evidence in some genera, e.g., *Arctogeophilus* and probably some geophilines, that they have been incorporated secondarily into the definitive second maxillary coxosternites. Since their basic morphological identity is unclear, and since in any event the evidence suggests they are not entirely or possibly not at all pleural in origin, it seems preferable to apply to them some other, simply descriptive term—one without morphological implications or inferences of homology. For this reason I propose that they be called postmaxillary sclerites.

Note C, Prehensorial Poison Apparatus: Apparently the first person to recognize the sclerotized poison calyx as a valuable diagnostic adjunct was Verhoeff, who utilized it in several studies of the genus *Strigamia* (*Scolioplanes*, and *Linotaenia* of authors). The shape and position of the calyx is apparently quite constant for the species. Having investigated such characters quite carefully, I find them to be of considerable utility, for instance, in distinguishing between closely similar but different congeneric species. The calyx is located at the anterior end of the poison gland, presumably drains it, and releases the venom to the poison canal.

Though he made effective use of the poison calyx, Verhoeff overlooked the poison gland as a source of classificatory information. My own study of the poison gland is still in the initial stages; however, it seems clear that the gland can often provide valuable auxilliary clues to identity at all levels from the specific to the familial.

Generally speaking, the degree of development or size of the poison gland seems inversely proportional to the development of the prehensorial telopodite as a whole. When the prehensor is large and ponderous (in some chilenophilines and mecistocephalids), the gland is often quite small and is restricted entirely to the body of the prehensor itself. Conversely, when the prehensor is tiny and fragile (in some ballophilines and geophilines), the gland is relatively extensive and often passes from the telopodite back into the associated prehensorial segment. I have observed exceptions to both rules, but in the main this inverse relationship seems widespread.

Both the calyx and the attached gland are readily seen if the whole prehensorial segment with telopodite attached are mounted in Hoyer's

fluid or, following thorough dehydration in alcohol, in Canada balsam. Treatment with KOH or NaOH is apt to distort the position and shape of the calyx and of course will destroy the fleshy gland.

Note D: Heretofore our only source of knowledge of *Taeniolinum* was Pocock's superficial and in some ways misleading original description (1893, pp. 471–472). The following brief diagnoses are based upon the recent examination of one of the two original cotypes, for whose loan I am indebted to G. Owen Evans of the British Museum of Natural History.

Taeniolinum Pocock

Generic diagnosis: Antennae not clavate nor geniculate; neither are they conspicuously attenuate. Labral teeth well developed and numerous; labrum weakly arched. First maxillary telopodite lappets long and robust; coxosternal lappets evidently absent. Second maxillary claw bipectinate. Prosternal sclerotic lines not apparent, i.e. not passing to or toward the prehensorial condyles. Tergites not sulcate. Each sternite from one through the penultimate bears a distinct pore field; no pore field raised or divided; pore fields of anterior third of body distinctly and transversely elliptical. Each coxopleuron has two essentially round and concealed pores; each pore is associated with a homogenous gland. Each ultimate leg is swollen and strongly, evenly attenuate distally; ultimate tarsus consisting of two articles; pretarsus is distinct and tuberculate.

Taeniolinum setosum Pocock

Species diagnosis: Male cotype, British West Indies, St. Vincent Island, collected at 3,000 ft. in moss on a mountain by H. H. Smith. Total length about 13 mm.; with 49 pairs of legs. Antennae neither clavate nor geniculate; distal half very weakly attenuate (the whole structure strongly contracted); articles 6–14 densely setose; each article but the 14th much broader than long. Cephalic plate slightly longer than wide; sides weakly rounded; rear margin straight and very slightly overlapped by succeeding plate. Clypeus without a typical clypeal area, in its position a subcircular field of minute pores; paraclypeal sutures pronounced; transbuccal sutures very vague; posterior margin straight, deeply pigmented and well sclerotized. Labrum very wide and weakly arched, nearly straight; the entire posterior margin with about 32 prominent, strong but pale teeth. Mandible with the undivided dentate lamella evidently having 6 strong, widely separated teeth. First maxillae without medial division; medial lobes long and triangular, lappets of coxosternum apparently absent; each telopodite indistinctly separated from coxosternum and indistinctly biarticulate, with a robust lappet equaling

the medial lobe in length. Second maxillae with postmaxillary sclerites not detected; pore entirely enclosed; isthmus broad and not sulcate or suturate; telopodite normal, claw distally spoon shaped with two finely pectinate edges. Prehensors having no article with denticles; ungula strongly curved over its distal third; poison calyx subcordiform; poison gland passing out of the prehensor posteriorly. Prosternum without sclerotic lines; anterior diastema broadly rounded and shallow, without denticles. Tergites not suturate. Sternites each much longer than wide, the majority weakly mediosulcate; pore fields of anterior third of body distinct but not raised, each subcentral and transversely subelliptical; on last third of body each pore field appears as a transverse single line of pores; sternites one through the penultimate with undivided pore fields. Ultimate pedal segment having pretergite laterally separated from its pleurites by weak sutures, the tergite posteriorly rounded and much broader than long; presternite broad and bandlike, medially weakly suturate or sulcate; sternite is trapezoidal, sides and rear margin straight, greatest length slightly greater than width at midlength; coxopleuron with two homogenous glands, each gland with one subcircular concealed pore; each leg greatly swollen and distally strongly attenuate, clothed with numerous stiff setae, with two tarsal articles and a tiny tuberculate pretarsus. Postpedal segments with short uniarticulate gonopods widely separated; terminal pores absent.

From the foregoing summary descriptions, it is apparent that *Leptynophilus* Chamberlin (1940, pp. 69–70) may be a junior synonym of the Pocock genus, although the original description of *Leptynophilus* is not sufficiently detailed or complete to permit a positive decision in the matter. In any event, I am unable at this time to find convincing grounds in Chamberlin's description for a generic separation of *T. setosum* from *L. mundus*, the two type species.

T. panamicum (1940, p. 69) is evidently a true *Taeniolinum*, although its original description does not show how it differs from *setosum*, if indeed the two species are not conspecific.

NOTE E, ANTENNAL SETAE AND SPECIAL SENSILLA: In general there are three kinds of setae that invest the antenna: (1) Typical setae occur generally over the surface of the antenna and vary from short and thin to quite long and thin. All are pale in color, movably affixed to distinct sockets (alveoli), and do not occur in special, restricted patches. These setae are evidently concerned with the reception of tactile environmental stimuli. (2) Hyaline spatulate setae occur in distinct patches and are restricted to certain areas of certain articles. These setae are very pale to translucent in color and arise either from vague, degenerate alveoli, or else appear not to be alveolate at all. In *Caritohallex minyrrhopus*, these setae are

restricted to a small area of the outer surface of the 14th article, but in *Ityphilus idanus* they occur on the outer as well as on the inner surfaces of the 14th article. Their appearance and possibly their position suggest a chemoreceptive function. (3) Sensory points, or sensilla, like the spatulate setae, occur in patches and quite constantly (at least intraspecifically) in the same positions on the same articles. These sensilla are distinctive in being very darkly colored, very short and robust, and indistinctly or not at all alveolate. Apparently they have lost much or all of the mobility that is typical of ordinary setae. I have observed such sensilla in many Geophilomorpha. Some of these points are probably responsive to environmental stimuli, but the positions of others suggest a possible proprioceptive role; that is, they may be positioned such that the movement of one antennal article against another would stimulate them, and this condition may well be concerned with supplying information pertinent to the position in space of the whole antenna, or of individual articles, or of groups of articles.

Note F, A New Maxillary Character: "Bicondylic" is a new term that I introduce in reference to the two condyles (one dorsal and one ventral) whereby the basal telopodite article is articulated with the second maxillary coxosternite. Evidently it has been overlooked that though there are usually two such condyles, in some genera there is only one. For instance, throughout the Holarctic genus *Arctogeophilus* there is, to the best of my knowledge, never more than one nodular condyle, the dorsal one, the ventral one having degenerated and vanished completely.

Note G, Geniculate Antenna: In alcohol the antenna is distinctly geniculate, i.e., its distal group of swollen articles is bent angularly to the axis of the series of more proximal filiform articles. This condition is not evident in figure 8 because in Hoyer's mountant an antenna tends to swell very slightly and to straighten.

Note H, Posterior Geminate Setae: In many geophilomorph genera—including some quite distantly related and representing different families—I have found a distinctive pair of clypeal setae to be of quite constant occurrence. Because these exhibit certain special characteristics and should prove to be of systematic significance, I term them specifically the posterior geminate setae. They always occur as a pair on or close to the body midline and usually somewhere on the posterior part of the clypeus, often quite close to the labrum. If they are homologous between groups, say from family to family, then they are conceivably persistent and very primitive structures. The alternative possibility, that they are only analogous and have arisen independently many times, of course, is not easy to discredit, especially since the geminate setae occur so widely and

apparently subserve some highly specialized sensory function. They may well have been "invented" a number of times in quite different organisms. One is reminded in this connection of the example of the eyes of squid and of vertebrates, organs that are grossly quite similar but not homologous. I believe that the posterior geminate setae serve a special sensory role of some sort and that they will prove important systematically once they have been investigated on a sufficiently broad scale.

Note I, the Statumen: The signal characteristic of the Chilenophilinae is the thickened sclerotic ridge running obliquely forward on each second maxillary coxosternite and passing ectal to the maxillary pore. To resolve the confusion that has arisen from the application of numerous phrase designations in each of the major languages, I have proposed that this ridge be given a single Latin name, "statumen" (strut or support, pl. "statuminia"). Future studies may show that the definition of the statumen given above may require further restriction since there is some evidence to support the suspicion that not all statuminia are homologous; i.e., some kinds may have arisen through evolutionary convergency. If this convergency can be proved, then it could follow that the group now recognized as the Chilenophilinae, (or Chilenophilidae) would require a general reorganization, possibly involving at least a partial fusion with fractions of the pachymeriine Geophilidae.

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MELOID BEETLES (COLEOPTERA) OF THE WEST INDIES

By Richard B. Selander and John K. Bouseman[1]

Introduction

The West Indies have never received attention from entomologists commensurate with their great biogeographical interest. Descriptions of West Indian species of Meloidae have appeared at irregular intervals since the first species was described by Fabricius in 1781, but no attempt has been made to treat these beetles comprehensively or to relate them to the beetle fauna of the American mainland. We therefore feel that the present report will be valuable, for by bringing together all available information on the Meloidae of the West Indies, the report will not only serve as a means of identifying the species of the islands but will perhaps also stimulate more widespread interest in the meloid fauna, so that the process of studying and interpreting it will be accelerated.

For the purpose of this report the West Indies are defined as including the Bahama Islands, the Greater Antilles, and the Lesser Antilles as far south as Grenada. Trinidad and the other islands associated with it along the northern coast of South America, while forming part of the West Indies in the physiographic sense, are excluded because they are on biogeographic grounds more logically treated as part of South America.

[1] A joint contribution of the Department of Entomology of the University of Illinois, and the Section of Faunistic Surveys and Insect Identification of the Illinois Natural History Survey.

Origin

The meloid fauna of the West Indies is known to include 9 species in 5 genera: *Meloe, Tetraonyx, Cissites, Pseudozonitis*, and *Nemognatha*. The species are listed in table 1, which also summarizes available distributional data. Although additional collecting may augment the present list of species, it is apparent that the meloid fauna of the islands is depauperate. In comparison, the Mexican State of Veracruz has nearly 50 species representing 8 genera, and Florida has 28 species in 7 genera. The scarcity of Meloidae in the West Indies is paralleled in a number of other animal groups, such as the amphibians and terrestrial mammals among the vertebrates (Darlington, 1957) and perhaps in a majority of the families of beetles among the insects.

The much richer representation of Meloidae in Florida than in the West Indies indicates that the scarcity of Meloidae in the islands is largely a reflection of physical isolation of the islands from the mainland rather than of their ecological uniformity or unsuitability. Veracruz has such great physiographic and climatic diversity that it might be expected to have more species of Meloidae than the West Indies, even if the West Indies were not isolated. But Florida, which is ecologically much more uniform than the West Indies, has more than three times as many species as the islands.

All known genera of Meloidae in the West Indies are represented also on the American mainland and in most cases abundantly. According to the classification that we have adopted, these genera represent two subfamilies and four tribes.

As shown in table 1, four of the nine species of West Indian Meloidae occur also on the mainland. So far, only two West Indian species (*Tetraonyx quadrimaculata* and *Cissites maculata*) have been recorded

Table 1.—*Geographic distribution of the West Indian Meloidae.*

Species	Bahamas	Cuba	Cayman Islands	Jamaica	Hispaniola	Puerto Rico	St. Thomas	St. Croix	Montserrat	Guadeloupe	Dominica	St. Lucia	St. Vincent	Grenada	SE United States	Mexico-Central America	South America
M. laevis					X											X	
T. quadrimaculata					X	X	X		X	X			X	X	X		
T. cruciata		X															
T. maestra		X															
C. maculata		X			X	X				X	X		X			X	X
P. marginata	X	X		X	X	X		X		X	X	X		X			
P. obscuricornis				X		X				X							
N. occupata		X															
N. punctulata	X	X	X	X											X		

from the island of Trinidad. Five of the species of the Greater Antilles are not present in the Lesser Antilles, but there are no species in the latter group of islands that do not occur in the former. Apparently the only island having endemic species is Cuba, with three. We do not propose to enter into a detailed comparison of the fauna of the various islands because the small number of species involved requires a more exact knowledge of the distribution of the fauna than we now have.

With respect to the origin of the West Indian meloid fauna, it is well first to discuss what information is available concerning the distributional and phylogenetic relationships of the individual species before summarizing our conclusions.

Meloe laevis and *Cissites maculata* not only occur in the Tropics of the American mainland but have related species in this area. Probably, *M. laevis* reached the West Indies from Central America, and *C. maculata* reached there from either Central or South America. The distribution of *M. laevis*, if it actually corresponds to that shown in table 1, presents an intriguing biogeographic problem. This species ranges on the mainland from southwestern United States south to Costa Rica, and is therefore evidently able to disperse with facility and to adapt to a relatively wide range of ecological conditions. On this account, the presence of this species in the West Indies is not surprising, but it is quite enigmatic that within this area the species should be apparently restricted to Hispaniola, which is among the islands farthest removed from the mainland.

Although *Nemognatha punctulata* is represented in the southeastern United States by a population only slightly differentiated from the West Indian population, the only species with which it shows a definite relationship are South American in disbribution. The fact that it has not been recorded in the West Indies south of Jamaica suggests that it may not have reached the islands directly from South America but rather through colonization from Central America by an ancestral species that has since either become extinct in Central America or has escaped the notice of collectors.

The same reasoning applies to *Tetraonyx quadrimaculata*. This species is replaced in continental South America (Brazil) by a very similar species, *T. bimaculata* Klug. Like *N. punctulata*, *T. quadrimaculata* has a population in the southeastern United States but has no known relatives there. On this basis the simplest explanation for the distribution of the species is that it derived directly from a South American stock and reached the United States from the West Indies. The Cuban species *T. cruciata* and *T. maestra* represent local derivatives of *T. quadrimaculata*.

The species *Pseudozonitis marginata*, which is presumably restricted to the West Indies, has its nearest known relative in the Central American *P. megalops* (Champion). Inasmuch as *P. marginata* occurs as far north as Andros Island in the Bahamas and as far south as Grenada, its failure to colonize the mainland at either end of its range is likely the result of an inability to compete with the mainland fauna rather than of difficulty in crossing over to the mainland. *P. obscuricornis* belongs to a species group that is otherwise recorded only from the southwestern United States; however, the genus *Pseudozonitis* has not been thoroughly studied in the Neotropics, and very likely other related species will eventually be found in Mexico and Central America, if not in South America.

Finally, the relationships of the Cuban endemic *Nemognatha occupata* are so questionable that we prefer not to speculate on the origin of this species.

We conclude on the basis of the above analysis that the West Indian meloid fauna derived from seven immigrant species, most or perhaps all of which arrived on the islands from the neotropical part of the mainland. Central America seems to have been the important source region for West Indian Meloidae, although two of the species may have reached the islands directly from South America. We find nothing in the relationships and distribution of the Meloidae that is incompatible with the theory of origin of the West Indian fauna recently outlined by Darlington (1957).

Dispersal

One important aspect of the meloid fauna of the West Indies not mentioned in the preceding discussion concerns how Meloidae disperse themselves. This aspect is also of more general significance because it offers strong indirect support for the theory that the islands of the West Indies are oceanic.

As larvae Meloidae are parasitic either on grasshopper egg pods or the contents of nesting cells of wild bees; as adults they are phytophagous (except for a few species that do not feed). Various degrees of host specificity are exhibited by different species both in the larval and adult stages. Because of this general complexity of their ecology, the Meloidae face special problems of dispersal, and it is therefore to be expected that they would be poorly represented in any area having a history of prolonged isolation.

Significantly, 5 of the 9 New World genera of Meloidae whose first instar larvae reach their feeding site by phoresy on adult bees are represented in the West Indian fauna (*Zonitis*, *Rhyphonemognatha*, *Gnathium*, *Hornia*, and *Tricrania* are absent); none of the nearly 20 New World genera of nonphoretic meloids (such as *Lytta*, *Pyrota*, and the dominant genus *Epicauta*) occur there. Apparently, the West

Indies have always been separated from the American mainland by a barrier so formidable to Meloidae that phoresy has been a prerequisite to successful colonization of the islands. That only a few of the phoretic meloid species have established themselves in the West Indies does not detract from our hypothesis.

Phoresy as a means of dispersal seems to confer two principal advantages on the meloids possessing it. First, by attaching themselves to adult bees, meloid larvae are able to take advantage of the powers of flight of their host, which in general are considerably greater than those of adult meloids. This advantage increases a meloid species' chances of crossing a physical barrier such as an extensive water gap and of reaching a suitable habitat. Second, since many meloid larvae frequently attach themselves to individual adult bees, a bee reaching and establishing itself in a new area may introduce several meloid individuals and thus considerably enhance the prospect of the species' success, particularly since the larvae attached to a single bee will develop and emerge as adults in the same locality.

The hypothesis that phoresy is an important factor in the dispersal of the Meloidae gains support from the fact that the West Indian meloid fauna is composed of two distinct groups. These, on the basis of phylogenetic studies pursued by the senior author (Selander), seem to have developed phoresy independently. *Tetraonyx*, *Cissites*, *Pseudozonitis*, and *Nemognatha* constitute one group (the subfamily Nemognathinae) and share a number of specialized characters besides phoresy. *Meloe*, on the other hand, closely resembles the nonphoretic Meloidae (which we place with it in the subfamily Meloinae) except in those features directly connected with phoresy. Indeed, we may say that the only distinctive similarity between *Meloe* and the rest of the genera represented in the West Indies that is conceivably critical in dispersal is phoresy.

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Museum (USNM); F. G. Werner, University of Arizona; and Fernando de Zayas, Havana, Cuba. (Abbreviations in parentheses are those used in designating institutional collections in the records section of species accounts given below; the abbreviation RBS in the records section designates the collection of the senior author.)

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Taxonomic Treatment

In the following accounts the synonymy listed for each species consists of a citation of the original description and of all subsequently published works that refer to the species as a part of the West Indian fauna. Diagnoses are given in place of full descriptions for certain species that have been adequately described elsewhere or that have an extensive range outside the area covered by the present study. In all other respects, we have attempted to make the accounts as complete as possible.

We have excluded from our treatment the species *Epicauta pennsylvanica* (DeGeer), a rather small, entirely black meloid ranging commonly through the greater part of the eastern two-thirds of the United States and recorded from Jamaica by Gowdey (1926, p. 13). Gowdey's record was based on two specimens collected by him in Hope Gardens, St. Andrew Parish, and now housed in the Gowdey collection at the Hope Garden Agricultural Experiment Station. Through the efforts of T. H. Farr, we were able to study one of these specimens, a typical male collected August 8, 1920. According to Farr (in litt.), the other specimen is dated October 10, 1920. In view of the information available, we concluded that Gowdey's specimens were accidentally introduced from the mainland (possibly as larvae in soil packed around roots of plants); the absence of subsequent Jamaican records indicates that the species did not succeed in establishing itself on the island.

Key to the Species of West Indian Meloidae

1. Wingless, entirely black beetles with shortened elytra . **Meloe laevis Leach**
   Wings and elytra fully developed; color not entirely black 2
2. Dorsal blade of tarsal claws smooth, without teeth; elytra orange, each with a large black basal spot and an even larger apical spot (sometimes partially fused), the spots covering at least two-thirds of surface 3
   Dorsal blade of tarsal claws with a double row of small teeth ventrally; color pattern of elytra not as above 5

3. Apical spot of each elytron relatively narrowly separated from basal spot, as in figure 2, or partially fused with it, well separated from sutural margin; color pattern of elytra a yellow cross on a black background (Cuba).
Tetraonyx cruciata Castelnau

Apical spot of each elytron broadly separated from basal spot, attaining sutural margin or nearly so; color pattern of elytra a wide median yellow fascia on a black background 4

4. Apical spot of each elytron exceeding middle; each elytron one-fifth as wide as long (southeastern Cuba) . . . . . **Tetraonyx maestra,** new species

Apical spot of each elytron not exceeding middle; each elytron one-fourth as wide as long (Hispaniola, Puerto Rico, and the Lesser Antilles).
Tetraonyx quadrimaculata (Fabricius)

5. Galeae produced as slender, contiguous sucking processes that are longer than the head 6

Galeae not extending much beyond mandibles, not longer than labial palpi, not contiguous 7

6. Galeae and antennal segment I yellow; vertex tumid; hind tibial spurs slender, acute; elytra finely punctate . . . . **Nemognatha punctulata** LeConte

Galeae and antennal segment I dark; vertex not tumid; hind tibial spurs greatly thickened, spoon shaped, obtuse; elytra coarsely punctate (Cuba).
Nemognatha occupata (Blackwelder)

7. Eyes small, lateral, not approaching each other beneath head; head strongly triangular; pronotum transverse; orange beetles with four black fasciae on each elytron . . . . **Cissites maculata** (Swederus)

Eyes large, approximate beneath head; other characters not as above. . . 8

8. Male fore and middle tarsi swollen and expanded; male and female sixth abdominal sterna as in figures 6 and 7, respectively.
Pseudozonitis marginata (Fabricius)

Male fore and middle tarsi not modified, similar in size to hind tarsi; male and female sixth abdominal sterna as in figures 9 and 10, respectively.
Pseudozonitis obscuricornis (Chevrolat)

Family Meloidae

Subfamily Meloinae

Tribe Meloini

Genus *Meloe* Linnaeus

This interesting and distinctive genus is primarily Holarctic in distribution and is more richly developed in the Old World than in the New World. There are 19 species in the New World fauna, all limited to the North American continent. Only four of these have been recorded south of the United States, and only two (*M. laevis* Leach and *M. tropicus* Motschulsky) are known to occur as far south as Central America. West Indian fauna includes only a single species.

The principal taxonomic works on the New World species of *Meloe* are those of Champion (1891–1893) and Van Dyke (1928).

Meloe laevis Leach

Meloe laevis Leach, 1815, p. 249, pl. 8, fig. 4.—Champion, 1891–1893, p. 366.—Borchmann, 1917, p. 127.—Denier, 1935, p. 174.—Blackwelder, 1945, p. 488.
Meloe barranci, Leng and Mutchler, 1914, p. 467 (name used in error).

Diagnosis: Entirely black; surface satiny, dull. Antennae rather short, heavy, moniliform in both sexes. Head and pronotum very finely, sparsely punctate, glabrous. Elytra much shortened, divergent, impunctate, almost smooth. Hind wings absent. Abdomen impunctate, glabrous, swollen, exposed; in the female the abdomen has the aspect of an inflated, elongate bag trailing behind the anterior part of the body; in the male the abdomen is smaller, but at least a few segments are exposed behind the elytra in dorsal view; the tergites in the female are reduced to small median plate on the posterior margin of each abdominal segment. Tarsal claws with dorsal blade smooth, not dentate. Total length, 14–33 mm.; length to end of elytra, 9–15 mm.

Type locality: Hispaniola ("Insula America St. Domingo").

Geographic distribution: This species is common on the North American mainland, where it ranges from Colorado and Arizona in the United States south through Mexico (including the Tres Marías Islands) and Central America to Costa Rica. In the West Indies, the species has been recorded only from Hispaniola.

Seasonal distribution: August 12 to September 16 on Hispaniola.

Records: hispaniola: Constanza, 3,000–4,000 ft., Dominican Republic, August 1938, P. J. Darlington, MCZ, one; Kenskoff, 6,000 ft., Haiti, August 12, 1924, M. Bates, MCZ, one; September 16, 1934, P. J. Darlington, MCZ, two; Mount Basil, 4,700 ft., Haiti, September 9, 1934, P. J. Darlington, MCZ, one.

Remarks: The Hispaniolan specimens are all females. We have compared them with specimens from a number of localities in Mexico and have been unable to find significant differences. The type of the species is in the British Museum (Natural History).

Habits: Unknown.

Subfamily Nemognathinae

Tribe Tetraonycini

Genus *Tetraonyx* Latreille

Restricted to the New World and primarily tropical in distribution, *Tetraonyx* is represented in South America (primarily Brazil) by 77 currently recognized species, in Mexico and Central America by 14, in the United States and Canada by 4, and in the West Indies by 3.

Haag-Rutenberg's (1879) monograph is the standard reference for the genus, but it should be noted that a number of species and varieties have been described since its publication.

***Tetraonyx quadrimaculata* (Fabricius)**

FIGURE 1

Apalus 4 maculatus Fabricius, 1792, p. 50.
Mylabris ruficollis Olivier, 1795, pp. 14–19, pl. 2, fig. 17.
Tetraonyx 4-maculatus, Haag-Rutenberg, 1879, p. 308.—Leng and Mutchler, 1917, p. 216.
Tetraonyx quadrimaculatus, Chevrolat, 1877, p. ix.—Fleutiaux and Sallé, 1889, p. 433.—Gundlach, 1894, p. 318 (in part).—Champion, 1896, p. 53.—Borchmann, 1917, p. 113 (in part).—Wolcott, 1924, p. 85; 1936, p. 209.—Denier, 1935, p. 168 (in part).
Nemognatha cubaecola, Gundlach, 1891, p. 258 (in part).
Tetraonyx quadrimaculata, Leng and Mutchler, 1914, p. 467 (in part).—Blackwelder, 1945, p. 487 (in part).—Wolcott, 1950, p. 321 (in part).
Tetraonyx quadrimaculatus var. *bimaculatus*, Staig, 1940, p. 142, pl. 57.

DESCRIPTION: Head, antennae, labrum, and mandibles black; maxillae and labium yellow except last segment of palpi infuscate. Pronotum and scutellum orange-yellow. Elytra orange-yellow, each with a black spot covering most of basal fourth and another covering most of apical two-fifths; hind margin of basal spot nearly straight; basal spot separated from sutural margin of elytron by a distance equal to or slightly greater than half the width of the scutellum at its apex and from lateral margin by about twice this distance; apical spot attaining lateral margin and apex of elytron, in most cases also attaining sutural margin but occasionally very narrowly separated, especially anteriorly. Wings pallid brown with dark apex. Under surface orange-yellow, except mesothorax and metathorax (or at least the pleurites), largely black, and the last one or two abdominal sterna of the same color. Femora orange-yellow except apices broadly black; tibiae and tarsi black. Pubescence dense, recumbent throughout, of the same color as surface except always yellow on under surface of thorax. Length, 6–12 mm.

Head subtriangular or triangular; occiput nearly straight; surface even on vertex, a little roughened on front, coarsely, densely punctate, dull; a fine smooth median line usually indicated from occiput to center of front. Eyes large, weakly emarginate. Antennae reaching (over vertex) base of pronotum, compressed-moniliform; segment I reaching about one-third distance across eye; II less than half and III fully half as long as I; III to V progressively wider and less compressed; VI to X similar to V, about one-third longer than wide. Pronotum transverse, one-half to nearly three-fourths wider than long, obviously wider than head; base sinuate medianly; hind angles distinct but not sharp; front angles well rounded; disk convex,

impressed along base; surface as on vertex. Elytra finely scabropunctate, dull. Both hind tibial spurs thickened, spatulate, the outer one usually wider.

Male having fore tarsi with first to fourth segments greatly expanded; first segment strongly asymmetrical, third only sightly so. Fifth abdominal sternum deeply, broadly emarginate. Sixth sternum moderately deeply, triangularly emarginate, impressed. Genitalia with gonostyli gradually divergent, slender, compressed, notched ventrally near apex; aedeagus slender, needlelike apically, lacking ventral hooks; dorsal hook small.

Female having fore tarsi only moderately expanded; segments symmetrical. Fifth abdominal sternum entire or nearly so. Sixth sternum truncate or very shallowly emarginate medianly.

Type locality: Of *T. quadrimaculata*, North America. Of *ruficollis*, given as "Siberia," obviously in error.

Geographic distribution: Trinidad, the Lesser Antilles, Puerto Rico, Hispaniola, and the Coastal Plain and Piedmont of the southeastern United States from North Carolina to southwestern Alabama (Mobile County) and northern Florida (Alachua and Putnam Counties).

Seasonal distribution: Adults have been collected in the West Indies in every month of the year except November. In the United States they are recorded from July 21 to October.

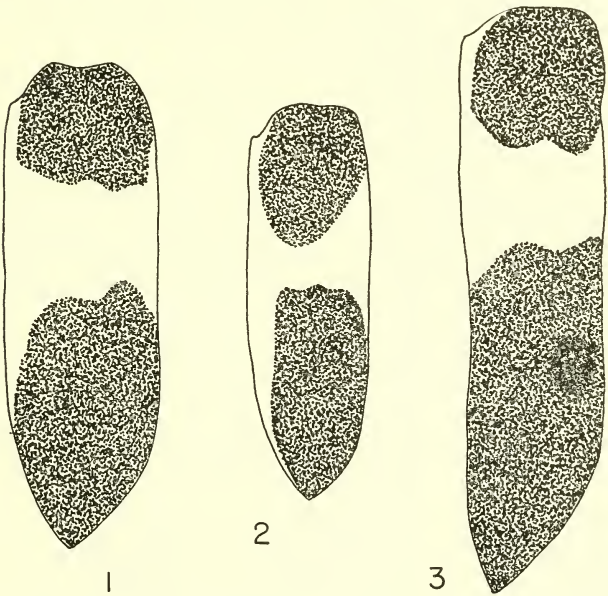
Records: grenada: Mount Gay Estate, leeward side, H. H. Smith, BM, one. guadeloupe: August 1956, R. Bénard, INRA, one; Camp-Jacob, 500–600 m., March (Fleutiaux and Sallé, 1889). hispaniola: Puerto Plata, Dominican Republic, August 29 to September 2, 1938, P. J. Darlington, MCZ, one; Villa Altagracia, Dominican Republic, July 1938, P. J. Darlington, MCZ, one. montserrat: March 23, H. G. Hubbard, USNM, two; 1894, H. G. Hubbard, USNM, one; H. A. Ballou (donor), USNM, one. puerto rico: Country label only, RBS, one; Arroyo, February 1899, A. Busck, USNM, one; Bayamón, April 9, 1934, USNM, seven; Guajataca, December 28, 1943, Rosamo, UPR, one; Haltillo, March 21, 1937, J. Bruast, UPR, one; Indiera Alta, Maricao, June 5, 1944, J. A. Ramos, UPR, four; Isabela, January 1940, J. Usera, UPR, one; Jayuya, December 1932, C. Gonzales, MCZ, one; mountains east of Maricao, July 28, 1943, J. A. Ramos UPR, one; Trujillo Alto (Wolcott, 1950); Vega Alta, May 23, 1933, Mills and Anderson, USNM, two; Villalba, October 15, 1930, C. G. Salazar, UPR, one; Yauco-Lares Road, Kilometer 22, July 25, 1953, J. A. Ramos, UPR, three. st. thomas (Haag-Rutenberg, 1879). st. vincent: South end, H. H. Smith, BM, one; windward side, 1896–1898, H. H. Smith, USNM, one.

REMARKS: The description given above applies to the West Indian material listed as well as to six specimens from the United States and two from the island of Trinidad (Fry collection, British Museum). Besides the original description, references to *T. quadrimaculata* in the United States include LeConte's (1853) redescription and the records of Blatchley, Brimley, and Löding cited below under "habits."

There is noticeable variation in *T. quadrimaculata* in several characters, but apparently only the shape of the male sixth abdominal sternum varies geographically.

Variation in color is limited largely to the relatively minor point of whether the apical black spots of elytra actually attain the sutural margins and to the extent of black markings on the under surface of the body. One of the males from the United States is exceptional in that only the sixth abdominal sternum (rather than the fifth and sixth sterna) is black. This specimen also has the black thoracic marking reduced to a suffusion partially covering the pleurites on each side.

Variation in size (as expressed by the length of the elytra) and in the proportions of the pronotum and elytra is indicated in tables 2



FIGURES 1–3.—1, *Tetraonyx quadrimaculata*, right elytron (Montserrat); 2, *T. cruciata*, same; 3, *T. maestra*, same (holotype).

TABLE 2.—*Length of elytra (in millimeters) for four species of* Tetraonyx.

Species	Males		Females	
	Mean and Range	Number	Mean and Range	Number
T. quadrimaculata:				
United States	8.10 (7.2–9.4)	4	8.75 (8.5–9.0)	2
Hispaniola-Puerto Rico	7.85 (6.9–10.0)	13	8.77 (5.6–10.7)	12
Lesser Antilles	9.40 (7.2–10.6)	4	9.55 (8.3–10.8)	2
T. cruciata: Cuba	6.40 (5.1–7.6)	8	6.74 (6.2–8.0)	6
T. maestra: Cuba			11.68 (11.1–12.2)	2
T. bimaculata: Brazil	7.8	1		

and 3. It will be noted that the average size of the females is slightly greater than that of the males.

The sixth abdominal sternum in males from the United States has relatively deep, regularly triangular, straight-sided emargination and rather evenly tapered lateral lobes. On Hispaniola and Montserrat the emargination is similar in form to the above but slightly shallower, and the lateral lobes are more noticeably rounded on the lateral margin. Males from Puerto Rico and St. Vincent differ from the rest in that the angle of the emargination is much more obtuse, with the sides of emargination definitely sinuate.

The species *Tetraonyx quadrimaculata* is a member of a closely knit and poorly understood complex that includes the Cuban forms *T. cruciata* and *T. maestra*, the Brazilian *T. bimaculata* Klug, and in all probability *T. maculata* Haag-Rutenberg. We have not seen specimens of the last form, which is recorded from southern Mexico and Central and South America, but from its description we concluded that it is intimately related to *T. quadrimaculata*. *T. cruciata* and *T. bimaculata* have long been regarded as varieties of *T. quadrimaculata*. However, we prefer to regard them as separate species for the present,

TABLE 3.—*Proportions of pronotum and right elytron (in percent) for four species of* Tetraonyx.

Species	Pronotum (length/width)		Elytron (width/length)[a]	
	Mean and Range	Number	Mean and Range	Number
T. quadrimaculata:				
United States	68.18 (66.7–70.8)	5	23.82 (22.8–25.0)	6
Hispaniola-Puerto Rico	66.61 (52.1–72.4)	25	24.72 (22.5–28.0)	25
Lesser Antilles-Trinidad	68.96 (61.7–69.0)	8	25.15 (23.2 26.9)	6
T. cruciata: Cuba	69.32 (61.0–75.3)	14	24.50 (21.0–26.0)	14
T. maestra: Cuba	74.25 (71.1–77.4)	2	20.60 (20.1–21.2)	2
T. bimaculata: Brazil	59.7	1	25.2	1

[a] Width measured at narrowest point between base and middle of elytron.

and interpret the complex to which they belong as a superspecies rather than a polytypic species.

On the basis of a single male that we examined from Nova Teutonia, Brazil, and Haag-Rutenberg's (1879) description, we concluded that *T. bimaculata* differs from *T. quadrimaculata* as follows: Color a deeper yellow; surface shinier, with the head and pronotum more finely and sparsely punctate; occiput distinctly convex on each side of the midline; front angles of pronotum well defined, not rounded; under surface of abdomen entirely black; male fore tarsi less strongly expanded, the first segment relatively weakly produced on anterior side. The sixth sternum is most similar to that of *T. quadrimaculata* from Hispaniola and Montserrat.

T. cruciata differs constantly from *T. quadrimaculata* only in the characters of elytral color pattern. In average size it is significantly smaller (table 2), but there is appreciable overlap. The male sixth sternum is most similar to that of *T. quadrimaculata* from Puerto Rico and St. Vincent. All the specimens of *T. cruciata* we have recorded are from central Cuba.

Judged from the two specimens studied, *T. maestra*, which presumably replaces *T. cruciata* in the mountains of Oriente Province of Cuba, is distinctly the largest representative of the *T. quadrimaculata* complex (table 2). Its elytral color pattern is unique. In addition, indications are that on the average the pronotum is more quadrate in form and the elytra more elongate than in the other species of the complex (table 3).

According to our view, *T. cruciata* and *T. maestra* represent lines of *T. quadrimaculata* that reached Cuba independently, probably at different times. Possibly the two forms subsequently differentiated in geographic isolation from each other, but it seems much more likely, in view of the marked displacement of their characters relative to those of *T. quadrimaculata*, that there was established at some time in their history a sympatric relationship leading to an accentuation of morphological (and probably ecological) differences between them. For a recent discussion of the evolutionary processes that might operate in such a situation, see Brown and Wilson (1956).

Habits: Wolcott's latest report (1950, p. 321) on the insects of Puerto Rico contains the following information regarding the habits of *T. quadrimaculata:*

> The beetles are possibly most often found on the flowers of leguminous plants in the more humid parts of the Island, but may occur on other kinds of flowers, as on flowers of "yerba bellaca" (*Croton humilis* [Euphorbiaceae]) at Isabela, of *Lantana camara* [Verbenaceae] at Trujillo Alto, and sometimes in such abundance as to cause appreciable injury, as on grapefruit [*Citrus paradisi* (Rutaceae)] blossoms at Bayamón, and on flowers of tecoma vine or "ricosolana" (*Pandorea ricasoliana* [Bignoniaceae]) at Isabela.

Earlier Wolcott (1924) recorded this species from *Aeschynomene americana* (Leguminosae) at Arecibo, Puerto Rico. The two specimens that we have studied from Vega Alta, Puerto Rico, are from *Lantana*.

In Guadeloupe Fleutiaux and Sallé (1889) recorded the species from *Duranta plumieri* (Verbenaceae). In the United States it has been recorded by Blatchley (1923) and Löding (1945) from *Bradburya* (=*Centrosema*) *virginiana* (Leguminosae) and by Brimley (1938) from butterfly pea (probably *Clitoria*, Leguminosae) and wild sweet-potato (*Ipomoea*, Convolvulaceae).

Tetraonyx cruciata Castelnau

FIGURE 2

Tetraonyx cruciatus Castelnau, 1840, p. 277.—Haag-Rutenberg, 1879, p. 308. Leng and Mutchler, 1914, p. 467.

Nemognatha cubaecola Jacquelin-Duval, 1856, p. 68, pl. 8, fig. 18.—Gundlach, 1891, p. 258 (in part).

Tetraomyx (sic) *cubensis* Chevrolat, 1858, p. 210.

Tetraonyx quadrimaculatus, Chevrolat, 1877, p. ix (in part).—Gundlach, 1894, p. 318 (in part).—Borchmann, 1917, p. 113 (in part).

Nematognatha cubaecola, Leng and Mutchler, 1914, p. 467.

Tetraonyx cubensis, Leng and Mutchler, 1914, p. 467.

Tetraonyx quadrimaculata, Leng and Mutchler, 1914, p. 467 (in part).—Wolcott, 1950, p. 321 (in part).

Tetraonyx quadrimaculatus var. *cruciatus*, Denier, 1935, p. 168.

Tetraonyx quadrimaculatus var. *cubaecola*, Denier, 1935, p. 168.

Tetraonyx quadrimaculata var. *cruciata*, Blackwelder, 1945, p. 487.

Tetraonyx quadrimaculata var. *cubaecola*, Blackwelder, 1945, p. 487.

DIAGNOSIS: Similar to *T. quadrimaculata* except as follows: Basal spot of each elytron longitudinally oval, attaining at least basal third of elytron; apical spot attaining middle of elytron, relatively narrowly separated from basal spot, with a tendency to fuse with it, separated at its anterior end from sutural margin by about same distance as from basal spot, this distance decreasing evenly to near apex of elytron. The color pattern produced is that of a rather fine, regular yellow cross on a black background. Average size of beetles smaller (table 2); total length, 7–9 mm. (see also table 3).

TYPE LOCALITY: Given in the original description of *T. cruciata* as "Saint-Dominque," presumably in reference to the Hispaniolan region now known as the Dominican Republic. We believe, however, that the locality is erroneous; the species has otherwise not been recorded outside Cuba. Of *N. cubaecola* and *T. cubensis*, Cuba.

GEOGRAPHIC DISTRIBUTION: Cuba (Havana and Las Villas Provinces).

SEASONAL DISTRIBUTION: July to November 8.

RECORDS: CUBA: Country label only, BM, one; Havana, C. E. Baker, USNM, one; T. Barbour, USNM, one; San Blas, 2,000 ft.,

Santa Clara (=Las Villas) Province, September 21, 1932, B.B. Leavitt, MCZ, two; Santiago de las Vegas, October 23, 1930, USNM, three; July 1951, F. de Zayas, RBS, one; Soledad, Cienfuegos, October 22–26 and November 8, 1926, P. J. Darlington, MCZ, six.

REMARKS: See remarks for *T. quadrimaculata.*

HABITS: Adults have been reported by Gundlach (1891) from *Duranta plumieri* (Verbenaceae), which is one of the food plants recorded for *T. quadrimaculata.*

Tetraonyx maestra, new species

FIGURE 3

DIAGNOSIS: Similar to *T. quadrimaculata* except as follows: Apical spot of each elytron exceeding middle of elytron (but still well separated from basal spot), attaining sutural margin throughout, truncate anteriorly. Pronotum and elytra, on the average, more elongate (table 3). Average size of beetles larger (table 2); total length 12.5–14 mm.

GEOGRAPHIC DISTRIBUTION: Oriente Province, Cuba.

TYPE MATERIAL: Holotype female from Pico Turquino, south side, 3,000–5,000 ft., June 1936, P. J. Darlington, in MCZ. Paratype female from Loma del Gato, Oriente Province, July 1953, F. de Zayas and Alayo.

REMARKS: See remarks for *T. quadrimaculata.*

HABITS: Unknown.

Tribe Horiini

Genus *Cissites* Latreille

This genus, with two species, is the Neotropical representative of the tribe Horiini, which in the Oriental and Ethiopean regions includes the genera *Horia* and *Synhoria.* In the larval stage the species of Horiini are nest parasites of carpenter bees (*Xylocopa*).

The presence of *Cissites maculata* (Swederus) in the West Indian fauna is well established, and this species is treated below. On the other hand, the reported occurrence of *C. auriculata* (Champion) in the West Indies is questionable. According to Champion (1891–1893), Guilding's record (1827) of a variety of *C. maculata* from Barbados having the "*porca* in duos processus auriformes irregulares expanditur" is probably referable to *C. auriculata.* This opinion was subsequently accepted by Leng and Mutchler (1917) in their list. However, the possibility that Guilding actually was dealing with a variant of *C. maculata* cannot be so easily discounted, nor can the possibility that a third species is involved be entirely dismissed. It therefore seems preferable to reserve assignment of Guilding's Barbados record pending further information (see footnote 2, p. 213).

***Cissites maculata* (Swederus)**

Cucujus maculatus Swederus, 1787, p. 199, pl. 8, fig. 8.

Horia maculata, Olivier, 1792, p. 102; 1795, No. 53 bis, p. 4, pl. 1, fig. A, 1.—Latreille, 1807, p. 211.—Castelnau, 1840, p. 279.—Fleutiaux and Sallé, 1889, p. 433.—Champion, 1891–1893, p. 371; 1896, p. 52.—Leng and Mutchler, 1914, p. 467; 1917, p. 216.—Denier, 1935, p. 151.

Cissites maculata, Gahan, 1908, p. 203.—Borchmann, 1917, p. 175.—Cros, 1928, pp. 108, 114.—Blackwelder, 1945, p. 482.—Wolcott, 1950, p. 321.—Enns, 1958, p. 63.

Horia auriculata Duges (sic), Wolcott, 1924, p. 85; 1936, p. 209. Misidentification.

Diagnosis: Orange. Antennae, mandibles, palpi, femoral apices, tibiae, and tarsi black. Each elytron with a heavy basal and apical black fascia and with two black fasciae between, the latter usually interrupted or constricted at middle, each formed by approximation or fusion of two spots. Upper surface shiny, subglabrous. Head and pronotum finely, densely punctate, smooth. Head unusually large, strongly triangular; tempora in male larger than in female but not so greatly swollen as to form a deep median groove on vertex and not excavate behind. Pronotum only weakly convex, strongly transverse, wider apically than basally. Antennae short; segments elongate-moniliform. Tarsi compressed. Tarsal claws with dorsal blade heavy, strongly curved, with a short double row of teeth ventrally at middle; ventral blade slender. Length, 18–25 mm.

Type locality: Unknown. Given as "New York Americae" in the original description, but this designation is probably incorrect.

Geographic distribution: Southern Mexico (Morelia, Michoacán), Central America, Tropical South America (including the Galápagos Islands and Trinidad), and the West Indies. In the West Indies the range extends along the arc of the Lesser Antilles to Puerto Rico, Hispaniola, and Cuba.

Seasonal distribution: Records exist of adults collected in the West Indies in February, March, July, September, and November and thus seem to indicate that the species reproduces more or less continuously throughout the year.

Records: cuba: De Zayas, (in litt.). dominica (Leng and Mutchler, 1917). guadeloupe: July 1957, INRA, one; Pointe-à-Pitre (Fleutiaux and Sallé, 1889); Trois-Rivières (Fleutiaux and Sallé, 1889). hispaniola: Port-au-Prince, Haiti, March 21–29, 1922, about 300 ft. alt. (Enns, 1958); "St. Dom.," BM, one. puerto rico: Camuy, November 1947, A. R. Rivera, UPR, one; Hormigueros (Wolcott, 1950); Mayagüez, February 8, 1944, J. A. Ramos, UPR, one; March 1934, J. R. Iñigo, MCZ, one; May 20, 1949, UPR, one; July 1–31, 1953, J. A. Ramos, UPR, three; Río Piedras, September 8, 1931, Alsina, MCZ, one; San Germán, February 12, 1935, S.

Vazquez, UPR, one. ST. VINCENT: Southern end of island, May, H. H. Smith, BM, one.

REMARKS: We have been unable to find significant differences between series of specimens from different islands in the West Indies or between the West Indian material and specimens from Brazil and Trinidad. Varieties in which the median two fasciae of each elytron are absent or in which the elytra are entirely black have been described from South America.

In Blackwelder's catalogue (1945) the reference to Puerto Rico in the list of localities for *C. auriculata* should be transferred to the list for *C. maculata*, as this reference is based on Wolcott's misidentification (1924, 1936) of the latter species.

Swederus (1787) described *C. maculata* from an unspecified number of specimens in the collection of "D. Davies." The present location of this material is not known to us.

HABITS: The literature on the parasitic association of *Cissites maculata* and various species of *Xylocopa* bees was briefly reviewed recently by Hurd (1958). Unfortunately, this review failed to mention the only definite association in the West Indies, that recorded by Fleutiaux and Sallé (1889), who noted that at Trois-Rivières, Guadeloupe, beetles had been observed coming out of the nest, located in the rafters of a stable, of a bee identified by them as *X. aeneipennis* DeGeer.[2] These authors also reported specimens collected at light on the same island. The specimen of *C. maculata* that we have studied from St. Vincent (previously reported by Champion, 1896) bears the notation that it was found dead under a rotten log.

The habits of the adult beetles have not been described. It is known, however, that in a related species, *Synhoria testacea* (Fabricius), the female oviposits in the burrow of the host bee, and it may well be that *Cissites* exhibits this same behavioral degeneracy. In this connection the absence of records of plant associations for adult *Cissites* beetles seems significant, for it has been established in the nemognathine genera *Tricrania* and *Hornia* that evolutionary elimination of the habit of ovipositing on the food plants of host bees is accompanied by loss of feeding activity on the part of the adult beetles.

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[2] The biological observations on *C. maculata* and *X. teredo* Guilding reported by Guilding in 1825 may have been made in the West Indies, as Hurd (1958) assumed, inasmuch as Guilding was living on the island of St. Vincent at the time that his article appeared. However, in this article Guilding did not give a locality for his observations, while in a supplementary note published 2 years later, Guilding (1827) implied that his observations were made in South America. Brues' citation (1924) of Barbados as the locality in question can be discounted; it was based on his failure to distinguish between the two articles of Guilding. Similarly, MacSwain's opinion, as expressed by Hurd (1958), that "the meloid identified by Guilding as *Horia maculata* is probably *Cissites auriculata*" certainly refers to Guilding's 1827 Barbados record and not, as implied by Hurd, to the insect treated by Guilding in 1825.

Tribe Nemognathini

Genus *Pseudozonitis* Dillon

The name *Pseudozonitis* is applied to the New World species of a group whose Old World representatives are currently divided among the genera *Zonitoschema*, *Zonitodema*, and *Zonitopsis*. With the assignment of the two West Indian species treated below the total species of *Pseudozonitis* has been brought to 20. The North and Central American species were revised recently by Enns (1956). The only South American member of the genus that we know of is an apparently undescribed species from Argentina.

Pseudozonitis marginata (Fabricius), new combination

FIGURES 4–7

Lagria marginata Fabricius, 1781, p. 159; 1787, p. 93.
Dryops marginata, Fabricius, 1792, pt. 2, p. 76; 1801, p. 68.
Oedemera marginata, Olivier, 1795, No. 50, p. 8, pl. 1, fig. 7.
Epicauta annulicornis Chevrolat, 1877, p. ix.—Gundlach, 1894, p. 319.—Leng and Mutchler, 1917, p. 216.—Borchmann, 1917, p. 70.—Denier, 1935, p. 152.—Blackwelder, 1945, p. 482.—Wolcott, 1924, p. 84; 1936, p. 208; 1950, p. 321. New synonymy.
Lytta delauneyi Fleutiaux and Sallé, 1889, p. 433.—Borchmann, 1917, p. 93.
Zonitis lineata Champion, 1896, p. 53.—Leng and Mutchler, 1914, p. 467.—Staig, 1940, p. 147, pl. 58.
Zonitis strigata Wellman, 1910, p. 26.—Borchmann, 1917, p. 164.—Denier, 1935, p. 149.—Blackwelder, 1945, p. 481. New name for *Zonitis lineata* Champion, not Melsheimer, 1846, p. 53. New synonymy.
Cantharis annulicornis, Leng and Mutchler, 1914, p. 467.
Cantharis delauneyi, Leng and Mutchler, 1914, p. 467.
Zonitis sp., Wolcott, 1924, p. 85 (record No. 613–13); 1936, p. 209.
Zonitis guanicana Wolcott, 1950, p. 321. New synonymy.
Zonitis annulicornis, Vaurie, 1950, p. 11.

DESCRIPTION: Light tawny orange-yellow. Apical half of mandibles black. Antennae, last two segments and apical half of first segment of maxillary palpi, last segment of labial palpi, femoral apices, tibiae (except immediate base), and tarsi fuscous. Antennae conspicuously annulate with orange-yellow at articulations of segments; tarsi not or only vaguely so. Elytra each with a rather broad, fuscous submarginal vitta and a similar subsutural one that are united at base and apex, leaving a narrow orange-yellow discal line, or with vittae broken medianly, or with vittae reduced to a fuscous basal mark and a subapical spot, or with no fuscous markings whatsoever. Wings nearly colorless. Pubescense moderately dense, short, pale. Length, 11–15 mm.

Head shape nearly as in *P. arizonica* (Van Dyke), subtriangular; width at tempora barely less than distance from top of vertex to base of labrum; vertex weakly tumid, flattened at center; surface moderately coarsely, densely punctate except for an ill-defined impunctate area between eyes, extending laterally on each side to antennal base and along midline to center of vertex. Eyes extremely large, separated on front by a distance varying from 3/10 to 2/5 width of head at tempora, separated beneath head by 1/4 to nearly 1/2 distance on front. Mandibles relatively short, strongly bent. Galeae lobiform, shorter than labial palpi. Antennae 4 2/5 to 4 4/5 as long as pronotum, very slender, setaceous; segment I definitely short of middle of eye; III as long as I; II shorter; IV about 2/5 longer than III; V to X subequal, as long or slightly longer than IV; XI 1/2 longer than II. Pronotum barely wider than long, quadrate campanuliform; sides subparallel for basal 2/3; disk impressed on each side before middle; surface moderately coarsely, densely punctate. Scutellum large, obtuse. Elytra densely rugose punctate, as in *P. pallida* Dillon and *P. megalops* (Champion). Hind tibial spurs enlarged, concave behind, subequal.

Male having fore and middle tarsi distinctly swollen and expanded; hind tarsi just perceptibly so. Fifth abdominal sternum moderately deeply emarginate medianly, with a triangular impressed, glabrous area medianly. Sixth sternum cleft, strongly impressed; each half of sternum medianly emarginate apically, strongly recurved at base, and with a small process on median margin near middle. Male

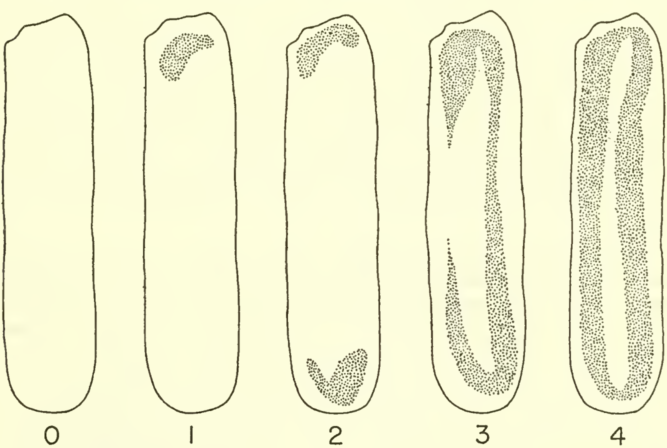


FIGURE 4.—*Pseudozonitis marginata*, variation in elytral color pattern. Numerals designate color classes (see text and table 4, p. 217).

genitalia as in figure 5; fused gonocoxites strongly tapered to a narrow apex.

Female having fifth abdominal sternum with surface entire or nearly so. Sixth sternum with a shallow V-shaped emargination medianly; lateral lobes of sternum broadly rounded. Pygidium weakly notched medianly.

TYPE LOCALITY: *P. marginata*, South America. Of *E. annulicornis*, Puerto Rico. Of *C. delauneyi*, Camp-Jacob, Guadaloupe. Of *Z. strigata* (=*C. lineata*), Balthazar, Grenada. Of *Z. guanicana*, Guanica, Puerto Rico.

GEOGRAPHIC DISTRIBUTION: Widespread in and apparently confined to the West Indies.

SEASONAL DISTRIBUTION: February 29 (1940) to July 6.

RECORDS: BAHAMA ISLANDS: Fresh Creek, Andros Island, April 23, 1953, E. B. Hayden and L. Giovannoli, AMNH, two. CUBA: Sierra de Cubitas, Paredona Cang., June 1955, F. de Zayas, RBS, one. DOMINICA: June–July 1913, H. W. Foote, USNM, one; A. H. Verril, USNM, one. GRENADA: Balthazar, H. H. Smith, BM, two. GUADELOUPE: June 1956, R. Bénard, INRA, one; Camp-Jacob, May (Fleutiaux and Sallé, 1889). HISPANIOLA: Dominican Republic (Vaurie, 1950); Port-au-Prince, Haiti, April 1925, G. N. Wolcott, USNM, one. JAMAICA: Mandeville, May 1958, F. S. Coon, IJ, one. PUERTO RICO: Aguas Buenas, April 8, 1944, R. Zayas, UPR, one; Guánica (Wolcott, 1950); Guánica Insular Forest, July 6, 1953, J. A. Ramos and J. Maldonado, UPR, one; Mayagüez, June 11, 1914, R. H. Van Zwalenburg, USNM, one; May 1938, R. del Moral, UPR, one; May 12, 1939, J. A. Ramos, UPR, one; February 29, 1940, W. E. Lang, UPR, one; May 1940, J. Vicéns, UPR, one; April 25, 1942, J. Hernandez, UPR, one; June 20, 1957, J. A. Ramos, UPR, one; San Sebastian, July 1938, J. Araujo, UPR, one; April 7, 1939, M. Aviles, UPR, one. ST. CROIX: 1937, 1941, and May 1, 1941, H. A Beatty, USNM, three; Canaan, not located, 1951, G. A. Seaman, USNM, six. ST. LUCIA: March 27 and April 21, 1936, R. E. Blackwelder, USNM, three.

REMARKS: The expanded male fore and middle tarsi, the somewhat elaborate modification of the male sixth abdominal sternum, and the form of the male genitalia readily separate *P. marginata* from all other known species of the genus *Pseudozonitis*; on the basis of these characters, a separate species group should be established for it. With respect to the male genitalia, *P. marginata* most closely resembles a male *Pseudozonitis* collected by one of us (Selander) in Oaxaca in 1955 and tentatively identified by us as *P. megalops* (Champion), a Central American form originally described from Guatemala. Except for the absence of the unusual sexual modifications noted

above, this specimen is quite similar to *P. marginata* in structural characters and agrees in color with immaculate specimens of the latter. We are therefore convinced that a closer relationship exists between *P. marginata* and P. *megalops* than between *P. marginata* and any other species of the genus.

The extensive synonymy of *P. marginata* is largely attributable to the fact that the elytra vary from a distinctly striped condition to an immaculate one. While this variation is essentially continuous, as a matter of convenience we have recognized five color classes. These are shown in figure 4, and their frequency distribution in the various samples is given in table 4. The absence of class 0 at localities between the Bahamas and Grenada is perhaps noteworthy. However, an analysis of the data now available indicates that the level of significance of the variation is slightly above the one percent level.

The ratio of the distance separating the eyes on the front of the head to the distance separating them beneath is unusually variable, without evident geographic or sexual correlation. The shape of the pronotum varies slightly, again on an individual basis.

We were unable to locate the types of *E. annulicornis* and *L. delauneyi*. The type of *P. marginata* is in the Hunterian Collection at Glasgow University, and the type of *Z. strigata* (=*Z. lineata*) is in the British Museum (Natural History). The type of *Z. guanicana* is neither in the collections in Puerto Rico nor in the U.S. National Museum; presumably it was destroyed. The male paratype of *Z. strigata* (=*Z. lineata*) that we examined was compared with the type of *P. marginata* by K. G. Blair.

TABLE 4.—*Frequency distribution of color classes in samples of* Pseudozonitis marginata.

Localities	Color classes					Number of specimens
	0	1	2	3	4	
Bahamas	2					2
Cuba			1			1
Jamaica			1			1
Hispaniola			1			1
Puerto Rico			[a] 7	2	[b] 4	13
St. Croix				6	3	9
Guadeloupe			[c] 1		1	2
Dominica					2	2
St. Lucia		1			2	3
Grenada	2		1	1	1	[d] 5

[a] Type of *Z. guanicana* (not examined) included.
[b] Type of *E. annulicornis* (not examined) included.
[c] Type of *L. delauneyi* (not examined).
[d] Type series of *Z. strigata* (specimens in classes 2, 3, and 4 not examined); specimen in class 3 questionably assigned from Champion's description and not included in analysis of variance.

HABITS: Several specimens are labeled as taken at light. It is interesting that of the total of 33 specimens examined, only 4 are males.

Pseudozonitis obscuricornis (Chevrolat), new combination

FIGURES 8–11

Epicauta obscuricornis Chevrolat, 1877, p. x.—Gundlach, 1894, p. 319. Borchmann, 1917, p. 79.—Wolcott, 1924, p. 84.—Denier, 1935, p. 158.—Wolcott, 1936, p. 208.—Blackwelder, 1945, p. 483.—Wolcott, 1950, p. 321.
Cantharis obscuricornis, Leng and Mutchler, 1917, p. 467.
Zonitis sp., Wolcott, 1924, p. 85 (record 590–13); 1936, p. 208.—Blackwelder, 1945, p. 482.
Zonitis smythi Wolcott, 1950, p. 321. New synonymy.

DIAGNOSIS: Similar to *P. marginata* except as follows: Pronotum frequently with a wide median rufous vitta. Elytra each with a rather broad, fuscous submarginal vitta and a similar subsutural one, these united at base and apex and leaving a narrow orange-yellow discal line, or with vittae narrowed and pale fuscous in color, or with vittae entirely absent. Middle of femora and tibial apices sometimes weakly infuscate. Length, 9–12 mm.

Distance separating eyes beneath head varying from one-fifth to two-fifths distance on front. Antennae even more slender than in *P. marginata;* segments I to III subequal in length. Pronotum as long as or barely longer than wide.

Male having fore and middle tarsi neither swollen nor expanded, similar in size to hind tarsi. Sixth abdominal sternum cleft, moderately impressed, each side evenly tapered, not emarginate, not recurved at base. Genitalia as in figure 8; fused gonocoxites broad, sinuate, abruptly curved dorsad at apex.

Female having sixth abdominal sternum with an extremely deep, oval emargination medianly.

TYPE LOCALITY: Of *P. obscuricornis*, Puerto Rico. Of *Z. smythi*, Guánica, Puerto Rico.

GEOGRAPHIC DISTRIBUTION: Apparently confined to the West Indies. Recorded from Jamaica, Puerto Rico, and Guadeloupe.

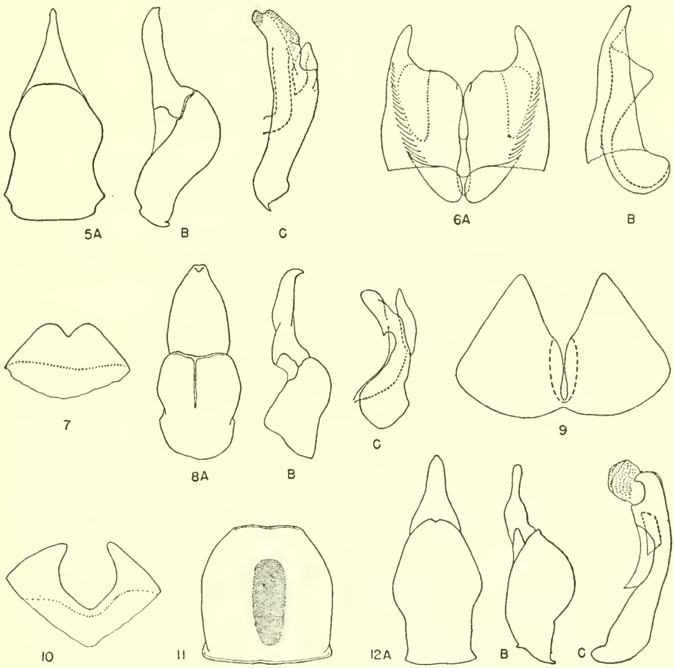
SEASONAL DISTRIBUTION: April to November 6.

RECORDS: JAMAICA: St. Andrew, Molynes Road, May 15, 1949, A. W. Wiles, IJ, three. GUADELOUPE: April 1957, R. Bénard, INRA, two. PUERTO RICO: Guánica, July 30, 1913, E. G. Smyth, USNM, one; Guánica Insular (or State) Forest, November 6, 1953, J. Maldonado, UPR, three; June 30, 1955, J. A. Ramos and J. Maldonado, UPR, five.

REMARKS: This species falls within the Longicornis group defined by Enns (1956). The three other species included in this group are presently recorded only from the southwestern United States.

The elytral vittae are narrowed in one of the specimens from Puerto Rico and in all three from Jamaica. In both specimens from Guadeloupe, the elytral vittae are entirely absent. The Jamaican specimens lack the rufous vitta of the pronotum.

We have examined five males, two each from Puerto Rico and Jamaica, and one from Guadeloupe. In the form of the genitalia, the male from Guadeloupe differs slightly from the males from Puerto Rico, whose genitalia are identical. One of the males from Jamaica has genitalia of the Puerto Rican type, while the other more nearly approaches the Guadeloupe specimen in this respect.



FIGS. 5–12.—*Pseudozonitis marginata* (Puerto Rico): 5, dorsal (A) and lateral (B) views of male gonoforceps, and (C) lateral view of aedeagus; 6, ventral (A) and lateral (B) views of male sixth abdominal sternum; 7, ventral view of female sixth sternum. *Pseudozonitis obscuricornis:* 8, dorsal (A) and lateral (B) views of male gonoforceps, and (C) lateral view of aedeagus (Jamaica); 9, ventral view of male sixth abdominal sternum (Puerto Rico); 10, ventral view of female sixth sternum (Jamaica); 11, pronotum (Jamaica). *Nemognatha occupata:* 12, dorsal (A) and lateral (B) view of male gonoforceps, and (C) lateral view of aedeagus.

We have not been able to locate the type of *E. obscuricornis*. The original description of *Z. smythi* was based on three specimens only one of which, it seems, is still in existence. This specimen is a female in the U.S. National Museum which we have designated as the lectotype.

HABITS: Several of the Puerto Rican specimens are labeled as collected at light.

Genus *Nemognatha* Illiger

There are 36 species of this genus represented on the North American mainland and 16 in South America. The species of the United States were revised recently by Enns (1956); the Mexican and Central American forms were treated by Champion (1891–1893). The South American species have received little attention and their literature is fragmentary.

The West Indian meloid fauna includes two species of *Nemognatha* representing two subgenera.

Nemognatha occupata (Blackwelder), new combination

FIGURE 12

Nemognatha atripennis Sturm, 1826, p. 72, pl. 3, fig. 26.—Borchmann, 1917, p. 166.
Zonitis occupata Blackwelder, 1945, p. 481. New name for *Nemognatha atripennis* Sturm, not Say, 1823–1824, p. 306.

DESCRIPTION: Orange-yellow. Antennae, labrum, apices of mandibles, palpi, galeae, femora (except base), tibiae, and tarsi fuscous. Elytra black with a metallic blue luster, the suture and lateral margin of each elytron sometimes orange-yellow from base to apical fifth. Wings pale. Pubescence pale on pale areas, dark on elytra and fuscous area of legs. Length, 5.5–8.5 mm.

Head similar in shape to that of *N. sparsa* LeConte but more elongate; distance from top of vertex to base of labrum one-tenth to one-fifth greater than distance across tempora; vertex evenly rounded; tempora rounded, not inflated; surface smooth, shiny, coarsely, moderately densely or densely punctate; pubescence short, semirecumbent. Clypeus less coarsely, sparsely punctuate. Labrum rounded at sides and apex, not impressed at base, moderately densely punctate, hairy. Mandibles long, straight from base until abruptly curved at apex. Palpi long, slender, the labial palpi extending one segment beyond mandibles. Galeae pubescent, attaining or approaching hind coxae in repose. Antennae long, 2⅔ to 3 times as long as pronotum; segment I swollen, curved, definitely short of middle of eye; II to V subequal, as long as I; VI to X slightly shorter. Pronotum as wide as to $\frac{1}{10}$ wider than long, widest at middle, gradually but decidedly narrowed to base, more abruptly narrowed to apex, much more hexagonal in

form than in related species; basal impressed line deep; disk impressed before middle, convex behind; surface smooth, shiny, coarsely punctate, the punctures moderately dense before middle and sparse behind, or sparse throughout; pubescense as on head. Scutellum subtruncate at apex, weakly impressed on midline. Elytra coarsely, very densely punctate, becoming scabropunctate at apical fifth; pubescence rather short, subrecumbent. Under surface of abdomen finely, moderately densely punctate, of thorax more coarsely punctate. Hind tibial spurs greatly thickened, spoon-shaped, concave behind.

Male having fifth abdominal sternum shallowly emarginate, impressed and subglabrous medialy in apical half. Sixth sternum cleft, broadly impressed medianly. Genitalia as in figure 12.

Female having fifth abdominal sternum not modified. Sixth sternum feebly emarginate.

Type locality: Cuba.

Geographic distribution: Apparently endemic to Cuba. We have records from three definite localities on the island, all at elevations below 1,000 ft.

Seasonal distribution: July 14 to September 22.

Records: cuba: near Guantánamo, C. E. Baker, USNM, four; San Germán, July 14, 1933, S. C. Bruner, USNM, one; Santiago de las Vegas, September 22, 1931, A. O. Otero, USNM, two.

Remarks: This species is a member of the subgenus *Pronemognatha* Enns. It does not seem to be particularly close in its relationships to any one of the four species included in this subgenus by Enns (1956). Interestingly, in the characters of the male genitalia it is more similar to the three species that occur in the southwestern United States than to the geographically more approximate *N. zonitoides* Dugès from Mexico and Central America. In Enn's key *N. occupata* runs to *N. sparsa* LeConte, from which it is easily distinguished by its more densely punctate, metallic elytra, subhexagonal pronotum, and dark galeae and by several other characters, including the distinctive male genitalia.

In the two specimens from Santiago de las Vegas the elytra are rather widely margined with yellow; in the specimen from San Germán they are finely margined; and in two of the Guantánamo specimens the very edge of the suture and lateral margin of each tend to be pale.

Although the present location of the type of *N. occupata* (=*atripennis*) is unknown to us, Sturm's descriptions and figure leave no doubt as to the identity of the species. It is worth noting that *N. occupata* was not included in Gundlach's (1891) work on Cuban insects, in Leng and Mutchler's lists (1914, 1917) of West Indian Coleoptera, or in Denier's (1935) catalogue.

Habits: Unknown.

Nemognatha punctulata LeConte

Nemognatha punctulata LeConte, 1853, p. 347.
Nemognatha testaceiceps Pic, 1916, p. 7. New synonymy.
Zonitis testaceiceps, Denier, 1935, p. 150.—Blackwelder, 1945, p. 481.

DIAGNOSIS: Orange-yellow. Elytra each with or without a black or fuscous vitta. Antennae (except segment I), apices of mandibles, last segment of palpi, apices of femora and tibiae, and tarsi black. Under surface varying from entirely pale to largely black or fuscous, the tip of abdomen always pale. Head with vertex tumid, tempora inflated; surface moderately coarsely, moderately densely punctate. Mandibles heavy, moderately long, curved at sides. Galeae pale, attaining hind coxae. Antennae heavy, about three times as long as pronotum; segment I attaining middle of eye. Pronotum transverse, rectangular; sides subparallel; surface sparsely or moderately densely punctate. Elytra finely, moderately densely punctate, densely microreticulate, clothed with short, semierect pubescence. Hind tibial spurs slender, acute. Male with third to fifth abdominal sterna each with a pale punctulate area medianly which is clothed with pale setae. Sixth sternum cleft and impressed in male, emarginate in female. Length 6.5–12 mm.

TYPE LOCALITY: Of *N. punctulata*, Georgia. Of *N. testaceiceps*, Cuba.

GEOGRAPHIC DISTRIBUTION: Jamaica, the Cayman Islands, Cuba, the Bahama Islands, and Southeastern United States.

SEASONAL DISTRIBUTION: March 15 to October 2 in the West Indies. Recorded by Enns (1956) in the United States from April 2 to September 27.

RECORDS: BAHAMAS: Andros Island, Lisbon Creek near South Bight, April 28, 1953, E. B. Hayden, AMNH, 1; Cat Island, Bennetts Harbour, March 24, 1953, E. B. Hayden, AMNH, 1; Great Abaco Island, Marsh Harbour, May 6, 1953, E. B. Hayden and L. Giovannoli, AMNH, 1; Gun Cay, MCZ, 1; New Providence Island, 2 miles east of Nassau, April 14, 1953, E. B. Hayden, AMNH, 1; North Bimini Island, August 2, 1951, P. and C. Vaurie, AMNH, 1; South Bimini Island, various dates from May to August 6, 1951, M. Cazier, W. Gertsch, F. Rindge, and C. and P. Vaurie, AMNH, 14. CAYMAN ISLANDS: Grand Cayman, July 7–8, 1958, M. H. Hatch, RBS, UW, 4. CUBA: Central Jaronú, May 27, 1930, L. C. Scaramusza, USNM, 1; September 6, 1934, USNM, 2; Havána, C. E. Baker, USNM, 2; Holquín, 1904, BM, 2; Las Tunas, July 16, 1933, S. C. Bruner, USNM, 1; Santiago de las Vegas, July 1916 and 1917, P. Cardin, USNM, 2; July 1951, F. de Zayas, RBS, 1; Santo Tomás, Península de Zapata, May 5–9, 1927, S. C. Bruner and J. Acuna, USNM, 1; Taco Taco, April 1–6, 1922, S. C. Bruner, J. Acuna, and C. H. Ballou, USNM, 1. JAMAICA: Bowden, October 2, 1951, C. B. Lewis, IJ, 1; Carrovannts,

August 9, 1947, C. B. Lewis, IJ, 1; 14½ miles east of Kingston, on Morant Bay Road, May 25, 1956, T. H. Farr, IJ, 5; 3 miles west-southwest of Logwood, March 25, 1955, T. H. Farr, IJ, 3; Upper Mountain View, St. Andrew Parish, March 15, 1949, C. B. Lewis, IJ, 1.

Remarks: This species is closely related to the South American *N. nigrotarsata* Fairmaire and Germain. Its population in the southeastern United States was treated by Enns (1956).

The elytra are more strongly microreticulate and therefore duller in specimens from the West Indies than in those from Florida with which we have compared them. All the West Indian specimens have vittate elytra. In one from Cat Island and another from Cuba, the vittae cover the elytra except for the suture and lateral margins. At the other extreme a specimen from Gun Cay and one from South Bimini Island have the vitta of each elytron reduced to a fuscous streak.

The specimens from Andros, Cat, Great Abaco, and New Providence Islands were collected by the Van Voast-American Museum of Natural History Bahama Islands Expedition, whose itinerary, together with a general account of the Bahama Islands, was given by Rabb and Hayden (1957). The remaining Bahama material was collected during a survey of the Bimini Island group, which was described by Vaurie (1952).

The lectotype of *N. punctulata* is in the Museum of Comparative Zoology. We have been unable to locate the type of *N. testaceiceps*. It is presumed to be in the collection of M. Pic, but we have been unsuccessful in our efforts to verify this.

Habits: Several of the specimens from Jamaica were collected on flowers of the composite *Bidens pilosa* by T. H. Farr. Dr. Farr also collected one specimen that had been captured by the reduviid bug *Zelus longipes* (Linnaeus).

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A REVISION OF THE GENUS OGCODES LATREILLE WITH PARTICULAR REFERENCE TO SPECIES OF THE WESTERN HEMISPHERE

By Evert I. Schlinger[1]

Introduction

The cosmopolitan *Ogcodes* is the largest genus of the acrocerid or spider-parasite family. As the most highly evolved member of the subfamily Acrocerinae, I place it in the same general line of development as *Holops* Philippi, *Villalus* Cole, *Thersitomyia* Hunter, and a new South African genus.[2] *Ogcodes* is most closely associated with the latter two genera. The *Ogcodes* species have never been treated from a world point of view, and this probably accounts for the considerable confusion that exists in the literature. However, several large regional works have been published that were found useful: Cole (1919, Nearctic), Brunetti (1926, miscellaneous species of the world, mostly from Africa and Australia), Pleske (1930, Palaearctic), Sack (1936, Palaearctic), and Sabrosky (1944, 1948, Nearctic). Up to this time 97 specific names have been applied to species and subspecies of this genus. Of these, 19 were considered synonyms, hence 78 species were assumed valid. With the description of 14 new species and the addition of one new name while finding only five new synonyms,

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[2] This new genus, along with other new species and genera, is being described in forthcoming papers by the author.

we find there are now 88 world species and subspecies. Thus, the total number of known forms is increased by 16 percent.

The accumulation and study of some 2,500 specimens of this relatively rare genus revealed that in order for the author systematically to treat this large number of species, two new subgenera and six species groups had to be delimited. Besides using conventional morphological features to distinguish species, an attempt was made to use both wing venation and male genitalia. Both were found to be very useful.

A discussion of geographical distribution, phylogeny, and biology was prepared to understand more fully the relationships of this cosmopolitan but rather homogeneous group of parasitic flies.

Acknowledgments

Without the help of numerous persons a study of this sort would have been difficult, if possible at all. I especially want to extend my sincere appreciation to Mr. Curtis W. Sabrosky of the U.S. Department of Agriculture, Washington, D.C., for his constant help and advice on the many problems of this project; Dr. Richard M. Bohart of the University of California, Davis, for his inspiration and advice and for reviewing the manuscript; and Dr. Willis J. Gertsch of the American Museum of Natural History, New York, for determining the host spiders of these flies.

Appreciation is expressed to the many persons who have aided in the collection of the acrocerids and to the following people and institutions for the loan of the important collections on which this study was based. (The abbreviations in the following list are used throughout the text to denote the location of specimens studied.)

ALM: A. L. Melander collection, Riverside, Calif. (A. L. Melander).

AMNH: American Museum of Natural History, New York, N.Y. (M. A. Cazier and C. H. Curran).

BMNH: British Museum of Natural History, London, England (H. Oldroyd).

BYU: Brigham Young University, Provo, Utah (V. M. Tanner).

CAES: Connecticut Agricultural Experiment Station, New Haven, Conn., (C. L. Remington).

CAM: Colorado Agricultural and Mechanical College, Fort Collins, Colo. (T. O. Thatcher).

CAS: California Academy of Sciences, San Francisco, Calif. (E. L. Kessel and E. S. Ross).

CDM: C. D. MacNeill collection, Berkeley, Calif. (C. D. MacNeill).

CHM: C. H. Martin collection, Corvallis, Oreg. (C. H. Martin).

CI: Commonwealth Institute of Entomology, London, England (F. I. van Emden).

CIS: California Insect Survey Collection, University of California, Berkeley, Calif. (P. D. Hurd, Jr.).

CM: Carnegie Museum, Pittsburgh, Pa. (G. Wallace).

CMNH:	Chicago Museum of Natural History, Chicago, Ill. (R. L. Wenzel).
CNM:	Canadian National Museum, Ottawa, Canada (G. E. Shewell).
CPC:	California Polytechnic College, San Luis Obispo, Calif. (H. E. Cott).
CSDA:	California State Department of Agriculture, Sacramento, Calif. (H. H. Keifer).
CU:	Cornell University, Ithaca, N.Y. (H. Dietrich).
DCB:	D. C. Bullock collection, Angol, Chile (D. C. Bullock).
DEI:	Deutches Entomologisches Institut, Berlin, Germany (W. Hennig).
EIS:	E. I. Schlinger collection, Riverside, Calif.
FRC:	F. R. Cole collection, University of California, Berkeley, Calif. (F. R. Cole).
GEB:	G. E. Bohart collection, California Academy of Sciences, San Francisco, Calif. (E. L. Kessel and E. S. Ross).
GS:	G. Steyskal collection, Grosse Ile, Mich. (G. Steyskal).
IE:	Istituto di Entomologia, Bologna, Italy (E. Mellini).
INHM:	Illinois Natural History Survey collection, Urbana, Ill. (H. H. Ross).
ISC:	Iowa State College, Ames, Iowa (J. L. Laffoon).
JKW:	J. K. Windsor collection, Los Angeles, Calif. (W. A. McDonald).
JP:	J. Parks collection, St. Paul, Minn. (J. J. Parks).
LAM:	Los Angeles County Museum, Los Angeles, Calif. (W. D. Pierce and E. G. Smyth).
LPG:	L. Peña Guzman collection, Santiago, Chile (L. Peña Guzman).
MCZ:	Museum of Comparative Zoology, Harvard University, Cambridge, Mass. (J. Bequaert and P. J. Darlington, Jr.).
MPM:	Milwaukee Public Museum, Milwaukee, Wis. (K. W. MacArthur).
MSC:	Michigan State College, East Lansing, Mich. (R. L. Fisher and H. King).
NCSC:	North Carolina State College, Raleigh, N.C. (D. L. Wray).
NYSM:	New York State Museum, Albany, N.Y. (J. A. Wilcox).
OAM:	Oklahoma Agricultural and Mechanical College, Stillwater, Okla. (F. A. Fenton).
OSC:	Oregon State College, Corvallis, Oreg. (F. F. Hasbrouck and V. Roth).
OSM:	Ohio State Museum, Columbus, Ohio (J. N. Knull).
PANS:	Philadelphia Academy of Natural Sciences, Philadelphia, Pa. (J. A. G. Rehn).
PHA:	P. H. Arnaud collection, Washington, D.C. (P. H. Arnaud).
RCF:	R. C. Froeschner collection, Ames, Iowa (R. C. Froeschner).
RHD:	R. H. Dodge collection, Missoula, Mont. (R. H. Dodge).
RHP:	R. H. Painter collection, Manhattan, Kans. (R. H. Painter).
RRD:	R. R. Dreisbach collection, Midland, Mich. (R. R. Dreisbach).
SJP:	S. J. Paramonov collection, Canberra, Australia (S. J. Paramonov).
SJS:	San Jose State College, San Jose, Calif. (C. D. Duncan).
SNHM:	San Diego Natural History Museum, San Diego, Calif. (C. F. Harbison).
SU:	Stanford University, Palo Alto, Calif. (G. F. Ferris).
TF:	T. Farr collection, Grand Rapids, Mich. (T. Farr).
TAM:	Texas Agricultural and Mechanical College, College Station, Tex. (H. J. Reinhard).
UA:	University of Arizona, Tucson, Ariz. (G. Butler and F. Werner).
UBC:	University of British Columbia, Vancouver, Canada (G. J. Spencer).
UCA:	University of California, Albany Insectary, Albany, Calif. (K. Hagen).

UCD:	University of California at Davis, Calif. (A. T. McClay).
UCLA:	University of California at Los Angeles, Calif. (W. A. McDonald).
UCR:	University of California at Riverside, Calif. (P. H. Timberlake).
UI:	University of Idaho, Moscow, Idaho (W. F. Barr).
UK:	University of Kansas, Lawrence, Kans. (R. H. Beamer).
U. Mass:	University of Massachusetts, Amherst, Mass. (C. P. Alexander).
UM:	University of Minnesota, Minneapolis, Minn. (E. F. Cook).
U. Miss:	University of Mississippi, University, Miss. (F. M. Hull).
UN:	University of Nebraska, Lincoln, Nebr. (L. W. Quate).
USAC:	Utah State Agricultural College, Logan, Utah (G. F. Knowlton).
USNM:	U.S. National Museum, Washington, D.C. (C. W. Sabrosky).
UT:	University of Tennessee, Knoxville, Tenn. (H. Howden).
UU:	University of Utah, Salt Lake City, Utah (G. F. Edmunds, Jr.).
UW:	University of Wisconsin, Madison, Wis. (C. L. Fluke).
VNM:	Naturhistorisches Museum, Vienna, Austria (M. Beier).
WCB:	W. C. Bentinck collection, Berkeley, Calif. (W. C. Bentinck).
WSC:	Washington State College, Pullman, Wash. (M. T. James).
ZI:	Zoologisches Institut, Berlin, Germany (F. Peus).
ZSI:	Zoological Survey of India collection, Calcutta, India (A. P. Kapur).

Methods

It was found desirable to prepare permanent slide mounts of the male genitalia, since other preservative methods were nearly as much work and were much less permanent. Such methods as placing the genitalia on card points or attaching them to the pin in small vials containing glycerine were discarded in favor of slide mounts when it was discovered that the solvent "Cellosolve" would rapidly dissolve many-year-old balsam mounts, even though they had been pre-hardened in a hot oven.

To dissect out the male genitalia the specimen is relaxed (after first removing all printed labels) in a petri dish containing distilled water and carbolic acid (to prevent molds). Rapid relaxing can be obtained by placing the petri dish under a light for 30 minutes or more. The specimen is then removed, turned venter up, and the head of the pin is inserted into a pinning block to a point where the dorsum of the specimen just touches the block. Using delicate forceps in one hand to hold the lateral tip of the abdomen, and inserting a small, sharply curved, minuten pin into the intersegmental membranes around the genitalia with the other hand, the genitalia can be eased out without extra injury to the specimen. The genitalia are then placed in distilled water, examined to see if all the parts were removed, and then placed in a 10 percent solution of potassium hydroxide (KOH). After warming for 5 to 15 minutes in this solution, the genitalia are removed and again placed in distilled water. At this time the parts are dissected and transferred into 70 percent

alcohol and the dissection is completed. After about 10 minutes the genitalia are placed in Cellosolve for not longer than 30 seconds, after which the parts are mounted in balsam. Cover slips need not be added until after the study of the parts is completed (perhaps an hour, week, month, or even years), since whenever a reexamination of the genitalia is desired all that is required is a drop of Cellosolve applied to the top of the balsam, and in a short time a minuten may be inserted and the parts rotated to the desired position for studying or illustrating.

The first-instar larvae were prepared in about the same manner as the genitalia, but for quicker, clearer, less distorted mounts, Berlese fluid was used in place of balsam. Larvae can either be killed first in alcohol or mounted alive in the Berlese fluid. In either method good mounts can be achieved only when the cover slips are applied immediately and pressed firmly to flatten out the larvae. A small amount of heat applied underneath the slide quickly hardens the Berlese fluid and flattens out the larva to a more desirable mount.

The maps were made by first plotting the distribution of the species with black dots made with a drop-pen. After delimiting the area believed to be occupied, or believed able to support the species, the Zipatone overlay was applied. The paraffin base of the Zipatone allows for fast, sure attachment to the map surface. The Zipatone is then cut along the desired margin with a scribe. The distribution maps of Nearctic species were prepared with the help of certain records cited by Sabrosky (1944, 1948). All illustrations of morphological structures were made with the aid of microscopes and a camera lucida. All figures are greatly enlarged, particularly those of the male genitalia.

In order to rear adult parasites from their hosts, live spiders were collected from suitable localities thought to have parasites present. The spiders were brought into the laboratory, placed in individual vials, and fed with any available insect food. In time, either the host matured or a parasite larva emerged. Mature spiders rarely yield any parasites; therefore, when collecting spiders in an attempt to rear parasites, one should be careful to select the immature forms.

First-instar larvae were obtained by collecting live adult female flies and placing them in large jars. Although eggs are not easily deposited by species of many genera of acrocerids, *Ogcodes* species usually do so with apparent ease. The eggs are then placed in a petri dish containing a piece of wet blotting paper, and in several weeks the young larvae usually appear.

Geographical Distribution [3]

Ogcodes is a cosmopolitan genus comprising 88 species and subspecies. These forms are found in the various regions as follows: Australian, 23; Ethiopian, 12; Nearctic, 18; Neotropical, 9; Oriental, 10; Palaearctic, 19; Polynesian, 3. There are several important areas where *Ogcodes* species have either not been collected or where they have been unable to reach and adapt. As shown in text figure 1, species are absent from such islands as Madagascar, West Indies, Greenland, Iceland, Ireland (?), Canaries, Sumatra, Borneo, Celebes, New Guinea, Formosa, Hawaii, and apparently all the smaller mid-oceanic islands, as well as from most land areas north of the Arctic Circle and south of the Antarctic Circle. That *Ogcodes* species have not been barred from adapting themselves to island faunas is attested by the fact that they occur in England, Ceylon, Java, New Zealand, Tasmania, the Philippines, and Juan Fernandez Islands. Besides *Ogcodes* species not populating certain islands, they are apparently satisfactorily barred from all the major desert regions of the world.

The great majority of species are restricted to a single region. Notable exceptions are *Ogcodes guttatus* Costa, which inhabits the Ethiopian, Oriental and Palaearctic regions, and *O. dispar* (Macquart) and *O. pallidipennis* Loew, which occur both in the Nearctic and Neotropical regions. Although there are no known truly Holarctic species, *O. eugonatus* Loew, *O. melampus* Loew [both Nearctic], *O. nigripes* (Zetterstedt), and *O. zonatus* Erichson [both Palaearctic], are extremely closely related (see discussion under the Nearctic species). A further complication of this association is the fact that *O. caffer* Loew from the southern Ethiopian region is also very similar.

Of the three subgenera recognized, only *Ogcodes* Latreille is cosmopolitan. *Neogcodes*, new subgenus, is restricted to the Nearctic subregion and *Protogcodes*, new subgenus, is an Australian endemic.

Concerning the subgenus *Ogcodes*, which contains 86 of the 88 species, I found considerable specific morphological evidence that aided me in determining the geographical relationships of the species. This was most easily accomplished through studying the six species groups (p. 249).

The *pallidipennis* group is widespread, occurring in all areas except the New Zealand subregion. It appears to be most common, however, in the Holarctic, Oriental and Australian regions, having apparently never reached New Zealand, and is not very common in the Ethiopian region.

The *colei* group is also widespread but in a much more restricted

[3] The divisions of geographical regions adopted here follow that outlined by Beaufort (1951) for the most part. I have, however, made subregions out of his Australian, New Zealand, and Oceanic Islands regions and changed the last-named region to Polynesian subregion.

pattern. Species of this group are known only from the Nearctic subregion, Chile, Iran, New Zealand and Tasmania. The relationships of species between New Zealand and the United States is surprisingly close, as nearly every species in the one area has a counterspecies in the other. One species is known from the Palaearctic subregion, so it is probable that species of this group will be found to inhabit the Oriental region as well.

The *eugonatus* group, though much more restricted, has a distribution similar to that of the *pallidipennis* group. Representatives are known from the Holarctic, Ethiopian, and southern Neotropical regions.

The *brunneus* group is endemic to New Zealand.

The *borealis* group is Holarctic. It seems probable that it had a much greater distribution in the past, as based on the present day relationships, through members of the *colei* group.

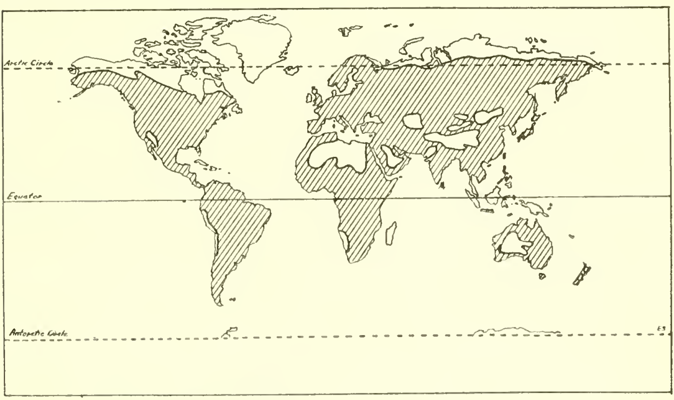

FIGURE 1.—Distribution of the genus *Ogcodes* in the world.

The *porteri* group is a Chilean endemic which likely will remain so due to the strong geographical barriers present, just as is the case for so many animal species occurring there.

It seems advantageous here to discuss species distribution on a regional basis as well, since there appear to be definite trends of relationships appearing for the first time. The 23 Australian species are divided into 11 from Australia, 6 from Tasmania, and 7 from New Zealand. Only one species occurs in any two of the areas, that being *Ogcodes fortnumi* Westwood, which is now known from Tasmania and Australia. *O. basalis* (Walker) may be found to occur in Tasmania, since it is a common species in Australia (see discussion under *basalis*).

As mentioned earlier the relationship of the New Zealand species is with the Nearctic species, there being no observable association with Australian species. There is a somewhat more pronounced general comparison between types of species in Tasmania and New Zealand than between the latter and Australia. The Australian species (through *O. basalis*) show a definite correlation to the Polynesian, Oriental and Palaearctic regions. The Polynesian species, of which there are only 3, exhibit an apparent transition between the Australian and Oriental regions. The Oriental region has 10 species, of which 9 are endemic. *O. guttatus*, the one nonendemic species, reaches into the southern Palaearctic and southern Ethiopian regions. For the most part, species of this region tend to merge into those of the Polynesian and Australian regions.

The Neotropical region contains 9 species, 2 of which are northern and occur more commonly in the southern Nearctic subregion. The other species exhibit rather definite and interesting relationships, some being affiliated with those of Tasmania and New Zealand, some with the Nearctic area, others with the Palaearctic area, while still others are strictly endemic and unrelated. The Holarctic region contains 37 species, nearly one-half of the total world species. These are evenly separated in 18 Nearctic and 19 Palaearctic species. The Holarctic correlation was mentioned above. Species of the Nearctic subregion show affiliation with all regions except the Oriental and Polynesian and show little endemicity. Those of the Palaearctic subregion likewise connect with many other regions, the only noticeable exception being the New Zealand subregion. There is also little endemicity shown for species of this region.

The other subgenera of *Ogcodes* are both monotypic. *Neogcodes* is Nearctic and related to Nearctic species, while *Protogcodes* is Australian and associated only with Australian species.

General considerations: This study of *Ogcodes* species has shown that the species groups have wide general distributions, most of them covering two or more geographical regions. Endemicity occurs in each area, but it is more common in the southern temperate faunas. Islandic populations occur throughout the world; however, many other insect-populated islands do not harbor *Ogcodes* species. The great deserts of the world appear to have formed a permanent barrier to these species, just as the colder limits of the Arctic and Antarctic Circles have formed impediments. And yet, apparently only one other acrocerid genus, *Acrocera*, appears to inhabit the Arctic climate with *Ogcodes*. There appear to be no pantropical or circumpolar distributional patterns in *Ogcodes*.

My studies would seem to indicate that both Holarctic and Australian-Nearctic-Neotropical distributions have occurred through the

Northwest Passage between Siberia and Alaska. There appears to be no evidence for assuming the presence of a one-time Antarctic land bridge to explain this distribution as has been the case with some other authors confronted with similar distribution problems. Species of the Australian-Nearctic-Neotropical distribution pattern have maintained a temperate, discontinuous distribution, and no doubt representatives of this group will be found to occur in China and other temperate East Asian countries. A similar cross-continent temperate distribution pattern occurs between the Nearctic, Palaearctic and Ethiopian regions.

From the evidence at hand it seems that the genus *Ogcodes* is best adapted to the temperate areas, both in numbers and species. However, further collecting in tropical areas may show them to be equally well inhabited. For further notes on distribution see the discussions under the various species in the text.

Phylogeny

Because many of the world species were not available for study, and because their descriptions did not contain the essential features necessary to account for their phylogenetic position, the phylogeny presented herein is obviously preliminary with the possible exception of the Nearctic fauna. Text figure 2 shows the probable relationships based on the species studied, which represented about 60 percent of those now known. No doubt other subgenera and species groups may have to be set up at a later date, but at least an account of our present knowledge of the genus can now be shown with some degree of certainty.

A new South African genus appears to be the last traceable ancestor of the highly evolved genus *Ogcodes.* Since this undescribed genus possesses such features as a distinct proboscis, strong wing venation, and hairy eyes, it probably gave rise indirectly to the monotypic Chilean genus *Thersitomyia* Hunter, which, according to its original author (Philippi, 1871, as *Thersites*), was very similar to *Ogcodes* except in having hairy eyes.

Of the subgenera of *Ogcodes,* the new subgenus *Protogcodes* seems to retain the most primitive characters, such as stronger wing venation and more styliform antenna with a basal bristle, and judging from the relationship of *O. brunneus* (Hutton) with *O.* (*P.*) *paramonovi,* new species, I have assumed that the *brunneus* group is the most primitive one of the subgenus *Ogcodes.* There is little doubt that the *eugonatus* group originated from that of *brunneus,* and simply lost vein M_1 and crossvein m-cu. Just where the *borealis* group originated is questionable, but the presence of vein M_1 and crossvein m-cu, and male genitalia of the *brunneus-eugonatus* types as well as exemplifying

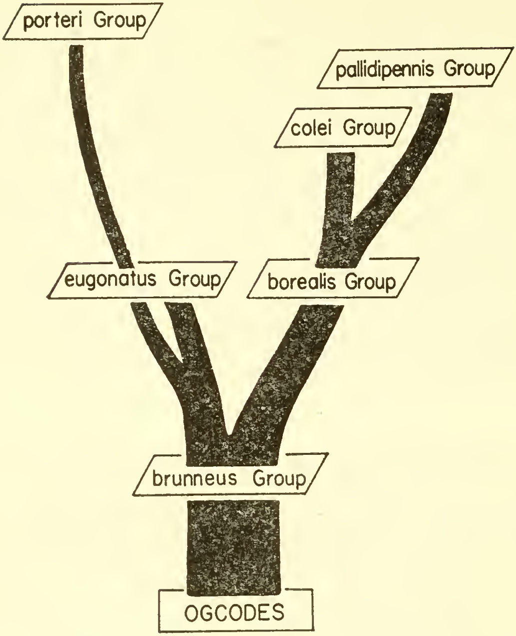

FIGURE 2.—Phylogenetic tree of *Ogcodes* species groups.

features of both the *pallidipennis* and *colei* groups, accounts for my placing it as ancestral to the two last-named groups. The species of the *pallidipennis* group have all retained vein M_1 but have lost crossvein m-cu, and have developed stronger, well-built male genitalia. Members of the *colei* group have retained (or lost) one or both of the wing veins, and have, for the most part, much-reduced male genitalia. From the *colei* group in the Nearctic region arose the monotypic subgenus *Neogcodes*, judging from its more reduced wing venation, male genitalia, loss of the antennal style, and the subsequent reduction in size of the terminal antennal segment. The *porteri* group has greatly reduced wing venation, but because the monotypic species is known from only one specimen, which did not possess antennae and whose male genitalia could not be examined, its placement and rank are both questionable. However, judging from the known distribution and wing venation, it probably represents a highly evolved group which was derived from a Chilean species of the *eugonatus* group.

In the phylogenetic tree for the Nearctic species (text fig. 3), only

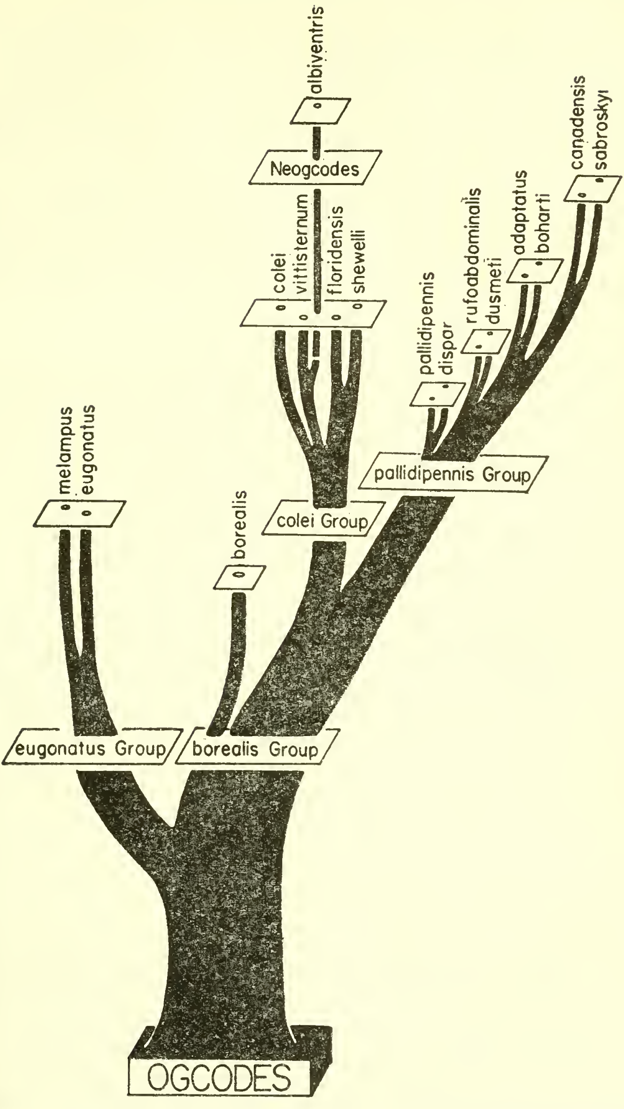

FIGURE 3.—Phylogenetic tree of Nearctic *Ogcodes* species. The species *niger* and *hennigi* have been omitted (see discussion, pp. 287, 305).

the correct placements of *niger* Cole and *hennigi*, new species, seem somewhat dubious. The richness of the fauna of this region is shown by the presence of two of the three subgenera, and four of the six species groups now recognized for the world. The *pallidipennis* group predominates, with *sabroskyi*, new species, being the most highly developed member. The four species of the *colei* group are all closely related but actually represent two different stocks. In certain features, *vittisternum* Sabrosky is quite similar to *floridensis* Sabrosky, while *colei* Sabrosky is likewise somewhat similar to *shewelli* Sabrosky, hence their position on the tree. The close approximation of *melampus* Loew and *eugonatus* Loew is due to the possibility of their being conspecific (see discussion, p. 279).

Biology

Although acrocerid biology as a whole is scarce, more work has been done on *Ogcodes* than all other genera put together. All known species are solitary internal parasites of true spiders (Araneae) during their larval stages. Since biological observations have been summarized recently by Millot (1938), Clausen (1940), and Plomley (1947b), a general outline sketch of my observations on several species is all that seems to be required at this time. For further notes on the habits of the particular species, see the discussion under the appropriate species in the text.

There are about 30 known host-parasite relationships for the genus *Ogcodes*. Although most of the common hosts belong to the spider family Lycosidae, the following families are also recorded as hosts: Amaurobidae, Salticidae, Psechridae, Thomosidae, Anyphaenidae, Clubionidae, Gnaphosidae, Agelenidae, and Theridiidae. For a complete list of host-parasite relationships see table 1.

Stein (1849) was the first person to observe the habits of these flies. Following him, the more important contributions were made by Gerstaecker (1856), Maskell (1888), Giard (1894), Konig (1894), Bovey (1936), Kaston (1937), Millot (1938), Dumbleton (1940), Clausen (1940, summary only), Plomley (1947b), and Kessel (1948). Of these works, those of Millot, Dumbleton, and Plomley are outstanding.

Oviposition: In all observed species, eggs are laid in great numbers, as many as 3,000 having been recorded for a single female during a four-hour period. They are deposited singly, varying with the species and time of day, from one every five seconds to about one every minute. They are almost always laid on or near the apices of dead twigs, and only rarely can they be found on growing plant parts. Usually, females are found congregated on a twig, laying their eggs

TABLE 1.—*Summary of the known host-parasite records of the genus* Ogcodes

(This table includes all new records cited in this paper. The names of the parasites conform to the present status, but the host names have not been corrected or changed since the publication of the record.)

Species	*Host spider*	*Locality*	*Authority*
adaptatus, new sp.	*Pardosa sternalis* Thorell (?) *Philodromus* sp. *Hololena curta* McCook (?)	California, U.S.A. California, U.S.A. California, U.S.A.	New record. New record. New record.
borealis Cole	*Xysticus montanensis* Keyserling. *Anyphanella saltabunda* Hentz	California, U.S.A. New Jersey, U.S.A.	New record. Sabrosky (1948).
brunneus (Hutton)	*Matachia ramulicola* Dalmas	New Zealand	Dumbleton (1940).
doddi Wandolleck	*Cosmophasis bitaeniata* Keyserling.	Australia	Dodd (1906).
eugonatus Loew	*Pardosa distincta* (Blackwall) *Pardosa banksi* Chamberlin *Pardosa sternalis* Thorell (?)	Ontario, Canada Connecticut, U.S.A. California, U.S.A.	Sabrosky (1948). Kaston (1937). New record.
gibbosus (Linnaeus)	*Prosthesima* or *Zelotes* sp. *Prosthesima* sp. *Trochosa* sp.	Denmark Denmark England	Nielsen (1932). Nielsen (1932). Locket (1939).
melampus Loew	*Tarentula kochi* Keyserling *Xysticus cunctator* Thorell	California, U.S.A. California, U.S.A.	New record. New record.
pallidipennis Loew	*Herphyllus* sp. *Hololena curta* McCook *Walmus* sp. *Steatoda palomara* Chamberlin and Ive *Pardosa saxatilis* (Hentz) *Lycosa* sp.	California, U.S.A. California, U.S.A. California, U.S.A. California, U.S.A. Connecticut, U.S.A. Connecticut, U.S.A.	New record. New record. New record. New record. Kaston (1937). Kaston (1937).
pallipes Latreille	*Xysticus luctuosus* Blackwall *Clubiona putris* Koch *Clubiona* sp. *Tarentula barbipes* Walckenaer *Phlegra fasciata* Hahn *Heliophanus* sp. *Lycosa pullata* Clerck *Aelurillus insignitus* Clerck	Poland England France Pyrenees England Pyrenees	Trojan (1956). Menge (1866). Giard (1894). Locket (1930). Millot (1938). Millot (1938). Locket (1939). Millot (1938).
varius Latreille	*Aelurillus insignitus* Clerck	France	Séguy (1926).
zonatus Erichson	*Heliophanus* sp.	Pyrenees	Millot (1938).

while walking either up or down the substrate. At times they appear to be so preoccupied that I have seen them laying eggs on the legs of other adults which have inadvertently gotten in the way while pausing to rest. The eggs are deposited without regard to the presence of suitable hosts, but, in most cases observed, the females do not fly far from their emergence site, and thus hosts would presumably be available to the larvae. The incubation period has been reported as being

from two to five weeks, depending upon external conditions of which humidity and temperature are the most important factors.

Egg: Dull brown to black, somewhat pear-shaped, finely reticulated, and quite small, rarely exceeding 0.35 mm. in length. Millot (1938) referred to an adhesive disc on the posterior end of the egg of *pallipes* Latreille which was used for its attachment. However, in *adaptatus*, new species, the disc is apparently wanting, and the eggs when laid seem to be sticky over the entire surface so as to adhere to the substrate at nearly any angle.

First-instar larva: The planidial larvae upon emergence may be seen "standing" erect beside the egg, and are ready in this position to attach themselves to any host which may pass by. There may be several days of this "standing" or "walking," the latter being done by bending the head down to the surface and moving the caudal segment forward in a fashion similar to that of a measuring-worm. If the larva does not come in contact with a suitable host, it may drop from the substrate to the ground or jump from place to place by springing itself into the air. I have observed that, upon contact with a host spider, the larva appears to be careful not to disturb it and moves only when the spider itself moves. At times a spider has been observed to remain quiet for hours, and during this period the *Ogcodes* larva has done likewise.

In most cases that I have seen, the larvae seemed to prefer entering the host along the dorsal-median-anterior region of the abdomen; and the total length of time involved to complete the parasite entrance was from 1 to 24 hours for *adaptatus*, new species. Several larvae were observed to enter the host through the intersegmental membranes of the legs, but about 50 percent of the larvae moved over the host's body and entered the abdomen as above, even when their primary attachment to the host was some distance from the abdomen. In my experiments active larvae of *adaptatus*, new species, have lived up to 10 days, but the average longevity was only 6 days. For other information on larval habits see Clausen (1940).

The first-instar larva (pl. 2, figs. 4, 5), which is best termed a planidium, is composed of 12 segments (the head and 11 somites), each well-sclerotized, and, except for the head segment, bearing various numbers and lengths of strong or weak setae. The larva measures about 0.30 mm. in length, and about 0.05 mm. in width. The head is minute and consists of a pair of anterior oral hooks, a pair of small dorsal setae, and a pair of apparently two-segmented, ventral antennae, each with a short distal seta. The mouth is just anterior to the point of antennal insertion. The buccopharyngeal armature consists either of two dorsolateral rods and one medioventral rod or two dorsolateral and two ventrolateral rods that extend back from the

articulation of the oral hooks. The differences in the formation of this structure appear to be specific among the species which have been figured, such as *brunneus* (Hutton) by Dumbleton (1940), *pallipes* Latreille by Millot (1938), and *adaptatus*, new species, as figured in this work. The chaetotaxy of the known species also appears to be specific. Each tergite usually has a row of setae along the posterior margin, while each sternite has several rows and various types of setae. The caudal segment bears one large, anterior, dorsal pair of setae, as well as several short setae, hooks, and a sucking disc at the apex. The single pair of spiracles are dorsal, posterior, and are located on a separate sclerite between segments XI and XII. The tracheae are quite straight, one to each spiracle, running nearly into the head segment. They are joined only once, just anterior to the spiracles. For further notes on the larvae see the references cited above.

MATURE OR THIRD-INSTAR LARVA: After the first-instar larva becomes attached inside the host, a period of time passes (varying apparently with the growth rate of the spider which is between 6 and 9 months) during which there are two molts. The third-instar larva develops rapidly, consumes most of the host contents, makes an exit hole along the epigastric furrow of the spider and emerges posteriorly. The larva is sticky on the surface and adheres, ventral side up, to the spider webbing, which is made just prior to the emergence of the parasite.

The third-instar larva is whitish and measures from 5.0 to 12.0 mm. in length. It has a small, yellowish white head, a distinct, yellow, barely segmented thorax bearing a pair of prothoracic spiracles, and a large abdomen of 9 apparent segments. The precaudal and caudal segments are somewhat restricted, and bear a pair of dorsal spiracles. The larva pupates in 1 to 3 days after emergence.

PUPA: Pupation occurs outside, but usually quite near the host's body. A distinctly coiled, dark brown to black meconium is passed as the prepupa is formed. The duration of the pupal period varies from 2 to 10 days, during which time the pupa becomes increasingly darker until just before adult emergence, when it is nearly black.

The pupa (pl. 1, fig. 1) is adult-like, having an obvious head, thorax, and abdomen, the whole of which measures from 4.0 to 10.0 mm. in length. The head has a curving row of papilliform protuberances on each side. There are prothoracic spiracles, and spiracles on abdominal segments II–V (sometimes referred to as I–IV). There are 9 visible abdominal segments, the first and last three of which are not separated into tergites and sternites. The scutellum is an obvious protrusion when viewed laterally.

HOST: Most of the Nearctic hosts are of the family Lycosidae or wolf-spiders. (For a complete host-parasite list, see table 1.)

The spider is usually killed prior to maturity and most often while in the penultimate instar. As has been observed by Locket (1930) and Schlinger (1952, for *Opsebius*), the spider spins a thin cell-like web just prior to its death, the web inadvertently acting to protect the maturing parasite. This web is similar, if not identical, to that spun by the spider prior to molting. The parasite larva is not discernible until about three hours before its emergence from the host, when close examination reveals the rapidly moving mouthparts which indicate consumption of the host. The host skeleton can usually be found just beneath the maturing parasite (pl. 1, fig. 1).

For this study, 45 specimens representing 5 species of *Ogcodes* have been reared from California spiders during the past 10 years. The hosts belonged to 9 species in 5 families, most of which were either Lycosidae or Agelenidae. Although there appears to be no definite host-parasite association, the fact remains that *Ogcodes* species, as well as all the recorded species of the subfamily Acrocerinae, are known only as parasites of the spider suborder Labidognatha. This compares well with the fact that acrocerids of the subfamily Panopinae are known to be parasitic on spiders of another suborder, the Orthognatha. No host data are available for the other acrocerid subfamily, the Philopotinae.

Adult habits: The adults are often encountered in great numbers by sweeping wet grassy areas such as meadows or grass-covered orchards, or by picking them up by hand from the dead branches where the females are depositing their eggs. For the most part the females are quite sluggish, primarily because of their gravid condition at emergence. The males, however, are much more active, and at times are difficult to catch even with a net. Mating usually occurs in flight, where, upon contact, the couple drops to the ground or onto a nearby bush to complete the process. If disturbed during mating, they may take flight, at which time they are easy to collect. Almost immediately after mating the female may begin to deposit eggs, thus showing that there is little if any time factor restricting the oviposition or fertilization processes after mating takes place.

The adult longevity periods for the known species under caged conditions vary from 3 to 12 days, with 3 to 4 weeks probably being the maximum span in nature. Apparently the adults take no food, and although it is possible that they obtain moisture through their oral membrane, no evidence has been found of their feeding on water, sugar-water, honey, flowers, or several nutrient solutions given them under caged conditions. (For more detailed results of adult habits and host-parasite relationships, see the discussions under *adaptatus*, new species, *borealis* Cole, *eugonatus* Loew, *melampus* Loew, and *pallidipennis* Loew.)

Predators and parasites: During the years of collecting acrocerids, I have observed several predators engaged in feeding on *Ogcodes* adults or their eggs. Feeding on the adults were spiders of the genera *Dictyna*, *Pardosa*, *Tetragnatha*, and *Xysticus*, an adult nabid (probably of the species *Nabis ferus*), an adult reduviid, and crabronids of the genus *Ectemnius*. Crabronids have been recorded in Europe as storing their nests with adult *Ogcodes*, while new crabronid-acrocerid associations and a summary of all available records of these relationships have recently been given by Bechtel and Schlinger (1957). The only egg predator seen was an adult raphidid, which was consuming considerable amounts of *O. adaptatus* eggs that had been deposited in large numbers on the dead twigs of *Artemisia* species.

I am not aware of any record of parasites of the late larval or pupal stages of *Ogcodes;* however, it seems quite probable that species of some hymenopterous families (such as the Pteromalidae) may be found to parasitize these flies.

Morphology

Male genitalia: For the sake of uniformity, the terminology used here follows mainly that of Sabrosky (1948). Since the genitalia of all species examined offered good to excellent specific distinctions, it is unfortunate that earlier and some present-day workers have neglected the use of specific characters, even though Wandolleck (1914) and Cole (1927) both have pointed out through illustrations that distinct differences existed among the various species. Plomley (1947a) described and figured the genitalia of *Ogcodes pygmaeus* (as *O. basalis*), but he did not attempt to differentiate any other species by using these structures. Sabrosky (1948) was actually the first to fully investigate the usefulness of male genitalia as specific characters, and his work formed the basis for the present interpretations. The genitalia (figured in pl. 6, fig. 31) consist of the following parts: Aedeagus, claspers, 9th tergite and cerci, 8th sternite, 8th tergite (not figured), and ejaculatory apodeme. All parts of the genitalia have morphological differences that distinguish the various species, but those exhibiting the most significant features are the aedeagus and the ejaculatory apodeme.

The aedeagus is a long rod-shaped organ, enlarged and sheathed basally. The sheath opens on the sides and becomes dorsal toward the apex. The ventral side is usually notched or angled either behind and/or beyond the seminal orifice (gonopore). These indentations are referred to as pregonoporal and postgonoporal notches, and it is this distal portion that has the definitive characteristics.

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There are three general types of ejaculatory apodemes shown in this genus. All these apodemes have a median plate, one or two median cells (basal and subbasal), and a pair of laterally extended wings (pl. 6, figs. 32, 33). As a rule, those species with a large median plate have large wings and those with smaller plates have smaller wings.

Sabrosky (1948) found four distinct types of genitalia in the Nearctic species of *Ogcodes*. These types were based primarily on the structure of the ejaculatory apodeme. These and other types are discussed below under the designated species groups of the subgenus *Ogcodes*.

Wing structures: Although the wing venation of this genus is relatively simple (pl. 3, figs. 6–13; pl. 4, figs. 14–21), and the veins at times difficult to ascertain, Sabrosky (1944, 1948) found that the presence or absence of vein M_1 was quite significant in distinguishing several named species that had been based mostly on color features. Because of this character he was able to establish considerable synonymy. He was able to show also the existence of a relationship between the venation and male genitalia, and he used these features as "species complex" characters. From my study of the genus it is evident that m-cu and r-m crossveins are equally important, and by using a combination of these and other veins it was found that not only were species groups evident but also that the species themselves for the most part could be identified by these features alone.

In an attempt to examine the venation more closely, wings of several species were mounted in balsam on slides, and it was found that short, sparse, stout hairs covered most of the costa, being more dense near the wing base, thinner near the tip, absent along the posterior margin, but again present to some extent along the anal margin. A few hairs were also observed on Sc, R_{4+5}, and M_4. Whether or not this characteristic is of any specific value will have to be determined by further study, but the presence of setae on the wing veins (as in several other acrocerid genera) and on the wing membrane (such as in certain species of *Ocnaea* Erichson and *Villalus* Cole) may be useful in studying evolutionary trends within the family.

Other characters: It was found that the structure of the antennae was quite variable within the genus, and antennae from several species were mounted on slides for study. The antennae of the species observed were found to be quite consistent for each species, and the number of apical setae on the terminal segment, the presence of a basal bristle on segment iii, and the great reduction of segment iii formed the basis for dividing *Ogcodes* into its three subgenera (pl. 5, figs. 23, 25, 27).

Another important specific character often overlooked is the type and amount of body pile. The length and placement of pile seems to be a fairly consistent group character in the subgenus *Ogcodes*.

Also, the color of the pile was found to be a reliable specific criterion within reasonable limits, but in any case the type of pilation should be noted in future descriptions. The color of the integument, as a specific character, although variable in some species, likewise was found to be reliable in the majority of those species examined.

Systematics

History: The genus *Ogcodes* was described by Latreille in 1796 but did not receive its type, *Musca gibbosa* Linnaeus, until 1802. Meigen (1804) discussed the genus under the name *Henops*, but this name was established by Illiger (1798) for *Syrphus gibbus* Fabricius, which is now the type species of *Cyrtus* Latreille. Meigen (1822) revised the genus *Ogcodes*, again under the name *Henops*, but at the same time suggested the emendation *Oncodes*, for *Ogcodes*. This emended spelling has been used at different times by many authors, but I agree with Sabrosky (1948, p. 408) in retaining the original orthography, although granting that *Oncodes* may be a better construction of the word.

Some of the more important contributions to the systematics of this genus were made by Meigen (1822), Erichson (1840), Gerstaecker (1856), Cole (1919), Brunetti (1926), Pleske (1930), Sack (1936), and Sabrosky (1944, 1945, 1948).

Genus *Ogcodes* Latreille

Ogcodes Latreille, Precis. Caract. Gen. Ins., p. 154, 1796; Hist. Nat. Crust. Ins., vol. 3, p. 432, 1802; Tabl. Method., *in* Nouv. Dict. d'Hist. Nat., vol. 24, p. 200, 1804.—Macquart, Hist. Nat. Ins. Dipt., vol. 1, p. 368, 1834.—Erichson, Entomographien, vol. 1, p. 169, 1840.—Gerstaecker, Stett. Ent. Zeit., vol. 27, p. 353, 1856.—Bigot, Ann. Soc. Ent. France, vol. 4, p. 89, 1856.—Schiner, Fauna Austriaca, vol. 1, p. 73, 1862.—Bigot, Ann. Soc. Ent. France, vol. 9, p. 319, 1889.—Wandolleck. Zoll. Anz., vol. 34, p. 549, 1909.—Coquillett, Proc. U.S. Nat. Mus., vol. 37, p. 578, 1910.—Wandolleck, Einl. Monog. Inflatae, pp. 4–30, 1914.—Cole, Trans. Amer. Ent. Soc., pp. 45–59, 1919.—Sabrosky, Amer. Mid. Nat., vol. 31, p. 387, 1944; Amer. Mid. Nat., vol. 39, p. 408, 1948.

Henops Meigen, Klass. Beschreib, Europ. Zweiflug. Ins., vol. 1, p. 150, 1804; Syst. Beschreib. Bekannten Europ. Zweiflug. Ins., vol. 3, p. 98, 1822.—Zetterstedt, Ins. Lapponica (1838), p. 573, 1840.—Walker, List Dipt. Ins. Brit. Mus., pt. 6, supp. 2, p. 353, 1854 (not Illiger, 1798).

Oncodes Meigen, Syst. Beschreib. Bekannten Europ. Zweiflug. Ins., vol. 3, p. 99, 1822.—Verrall, Stratiomyidae etc., Dipt. Brachy. Great Britain, vol. 5, p. 461, 1909.—White, Pap. Proc. Roy. Soc. Tasmania for 1914, p. 69, 1915.—Hardy, Pap. Proc. Roy. Soc. Tasmania for 1921, p. 77, 1922.—Séguy, Fauna de France, vol. 13, p. 166, 1926.—Brunetti, Ann. Mag. Nat. Hist., vol. 18, p. 590, 1926.—Pleske, Konowia, vol. 9, p. 163, 1930.—Sack, Die Fliegen, vol. 98, p. 15, 1936.—Millot, Bull. Soc. Zool. France, vol. 63, p. 162, 1938.—Hardy, Proc. Linn. Soc. New South Wales, vol. 45, p. 486, 1940.—Plomley,

Rec. Queen Victoria Mus., vol. 2, p. 17, 1947a; Rec. Queen Victoria Mus., vol. 2, p. 23, 1947b.—Hennig, Die Larvenformen Dipt., vol. 3, p. 91, 1952.—Paramonov, Pac. Sci., vol. 9, p. 23, 1955.—Trojan, Ann. Zool., vol. 16, p. 75, 1956.

Ogeodes, Gimmerthal, Bull. Soc. Imp. Nat. Mos., p. 167, 1847.—Schlinger, Wasm Journ. Biol., vol. 11, p. 320, 1953 (lapsus).

Ogkodes, Schiner, Verh. Zool.-Bot. Ges. Wein., vol. 15, p. 89, 1865.—Hennig, Die Larvenformen Dipt., vol. 3, p. 624, 1952 (lapsus).

Arcrodes, Froggatt, Australian Ins., p. 298, 1907 (lapsus).

Type of genus: *Musca gibbosa* Linnaeus as *Syrphus gibbosus* Fabricius (by subsequent designation of Latreille, 1802, p. 432, one species).

Generic diagnosis:[5] Small to medium-sized (2.5–10 mm.), gibbose, typically black or brown with yellow or white posterior fasciae on tergites (pl. 5, fig. 29), somewhat more irregular on sternites, or varicolored brown or black with white, yellow, or orange markings (pl. 5, fig. 30); pile present over most of specimen, long or short.

Head with bare holoptic eyes in both sexes (pl. 5, fig. 28); antenna 3-segmented, inserted just above mouth, segment I round and short, segment II of equal or slightly larger size, with or without short bristle, segment III styliform with single lateral sensory pit, with one to three short apical setae and with basal bristle, or short and blunt with five to six longer apical setae (pl. 5, figs. 23, 25, 27); proboscis present in living or dead specimens or absent in dead ones (pl. 1, fig. 3), if absent, the mouth area is covered by thin membrane; lateral ocellus present on small or rarely large vertex (pl. 5, fig. 28).

Thorax arched in front, scutellum large, well-raised (pl. 5, figs. 22, 24, 26), wing venation imperfect to extremely weak, costal vein reaching wing tip, m-cu and r-m crossveins present or absent, but usually veins present include at least Sc, R_1, R_{4+5}, M_4, and A; costal and subcostal cells present, usually with first, sometimes with second, basal cell present (pl. 3, figs. 6–13; pl. 4, figs. 14–21); legs usually slender, hind femur often swollen, tarsus with paired simple claws and three pulvilli.

Abdomen arched dorsally, flattened ventrally, tapering (male) or blunt (female) at apex, usually as high as wide, with six visible segments (pl. 5, figs. 22, 24, 26); male genitalia partly concealed under tergite VI, consisting of bowl-shaped 9th tergite, claspers, aedeagus, and ejaculatory apodeme, all more or less held in place by tergite IX (pl. 6, fig. 31); female genitalia simple, with obvious cerci and often with row of minute or larger setae along posterior margin of sternite IX.

[5] For adult. Descriptions of immature stages will be found in the biology section.

Key to the subgenera of *Ogcodes*

1. Terminal antennal segment narrowed and then bulbous basally, ending in a rather long tapering style on whose apex are one to four small setae (pl. 5, figs. 25, 27); proboscis usually not visible in dead specimens 2
   Terminal antennal segment shorter and broader basally, with several (usually 5–6) long apical setae (pl. 5, fig. 23); proboscis visible in dead specimen [Nearctic] . . . . **Neogcodes,** new subgenus
2. Frons bisected medially, without pile, though usually with minute tomentum; terminal antennal segment without basal lateral bristle (pl. 5, fig. 25) [Cosmopolitan] . . . . **Ogcodes** Latreille
   Frons not bisected medially, covered with obvious pile (pl. 5, fig. 28); base of terminal antennal segment with short, but strong, basolateral bristle (pl. 5, fig. 27) [Australian] . . . . **Protogcodes,** new subgenus

***Ogcodes (Protogcodes)*, new subgenus**

Type species: *Ogcodes* (*Protogcodes*) *paramonovi*, new species, by present designation.

Diagnosis: This subgenus, as based on *paramonovi*, appears to be ancestral to both of the other subgenera. The following characteristics separate this subgenus from the other two subgenera: Antenna with third segment styliform as in subgenus *Ogcodes*, but its apex beset with several small setae as in subgenus *Neogcodes*, but differing from both by having a strong basolateral bristle on terminal segment and a shorter dorsal bristle on segment II. The frons is convex, not grooved medially, and is covered with obvious pile. The legs are quite long and thin. The abdomen is wider than the thorax, and is turned under and narrowed apically. The venter has rather large, lateral intersegmental areas.

***Ogcodes (Protogcodes) paramonovi*, new species**

Plate figures 15, 27, 28, 60

Male: Length of entire specimen 7.75 mm., wing length 8.15 mm., head height 1.55 mm., head width 1.85 mm., head length 1.45 mm.

Head large, eyes nearly black, antenna dark brown, occiput dull black; frons large, about one-fourth head width, convex, covered with golden brown pile about one-third as long as antennal segment III (pl. 5, fig. 28); antennal segment I dish-shaped, short, segment II ball-shaped, fitting into I socket-like, both I and II covered with minute brown hairs; segment II has one dorsal bristle; segment III styliform, moderately swollen basally, with distinct bristle paralleling and about one-half as long as style, apex of segment with four, whitish brown setae (pl. 5, fig. 27); oral region oval, narrow, mouthparts rudimentary, but strong sclerotized proboscial plate present with long brown hairs crossing over below oral region.

Thorax dark brown, subshining, covered with yellowish brown pile about as long as antennal segment III; legs slender, not swollen, coxae, tarsal apices, claws, and pulvilli brown, remainder light brown, entirely covered with pile as on thorax, but gradually shortening towards extremities, hind femur and tibia of equal length; wing narrowed apically, nearly hyaline, faintly infuscated, veins dark brown except M_1, base of M_4, and anal, light brown or clear; crossvein m-cu present, crossvein r-m absent, but base of M_1 at this point long, extending near M_4, anal vein nearly joins Cu_2 at wing margin (pl. 4, fig. 15); squama large, opaque, snowy white, with dark brown margin, halter knob black on light brown stem.

Abdomen subshining, dark brown except light brown tergite I, tergites III and IV with extremely narrow posterior white fasciae, light brown sternites II-VI, and large white lateral intersegmental membranes between sternites I-V; tergites II-IV covered with pile (as on thorax) only on broad median area and narrow lateral margins; tergite V bare medially, but with similar pile on broad mesolateral and marginal areas; tergite VI bare medially, but with some marginal pile; sternite I shining, bare, II-VI covered evenly with pile as on dorsum, but shorter.

Genitalia small; aedeagus nearly acuminate at apex, and with distinct, subapical, ventral projection (pl. 9, fig. 60).

FEMALE: Unknown.

HOLOTYPE: Male, Ohakune (Wellington), North Island, New Zealand, 1922–23 (T. R. Harris, 1923–303, BMNH).

REMARKS: Superficially, *paramonovi* looks like (*Ogcodes*) *brunneus*, but its closest relative is no doubt an undescribed Australian species.[6] I take pleasure in naming this species after Dr. S. J. Paramonov, who has recently contributed much to furthering acrocerid taxonomy.

Subgenus *Ogcodes* (*Ogcodes*) Latreille, new status

Ogcodes Latreille, Precis. Caract. Gen. Ins., p. 154, 1796.

TYPE SPECIES: *Musca gibbosa* Linnaeus.

DIAGNOSIS: Antenna 3-segmented, terminal segment styliform, usually with one apical seta, sometimes with two or three, but never with basolateral bristle; frons bisected medially, without pile; proboscis (not visible in dead specimens) covered by thin oral membrane; abdomen commonly brown or black with white posterior fasciae on tergites, though often varicolored; legs sometimes with tibiae (particularly T_3) swollen distally.

DISCUSSION: Phylogentically, this subgenus divides into six species groups as based on wing venation, male genitalia, antennal structure

[6] This species has recently been described by Paramonov (1957) as *hirtifrons* (see appendix).

and pilation, but no doubt other groups will need to be added when more species can be studied. These species groups, together with typical species, distribution, and total number of presently assignable species, are listed in table 2.

TABLE 2.—*Species groups of the subgenus* Ogcodes *Latreille*

Species group	*Typical species*	*Distribution and included species*
I—*brunneus* group	*brunneus* (Hutton)	New Zealand (2)
II—*eugonatus* group	*eugonatus* Loew	Nearctic (2) Palaearctic (2) Ethiopian (2) Neotropical (1 ?)
III—*borealis* group	*borealis* Cole	Nearctic (1) Palaearctic (1)
IV—*colei* group	*colei* Sabrosky	Nearctic (5) Australian (6) Palaearctic (1) Neotropical (1)
V—*pallidipennis* group	*pallidipennis* Loew	Cosmopolitan except New Zealand (21)
VI—*porteri* group	*porteri* Schlinger	Neotropical (1)

The apparent relationships of these species groups are shown in text figure 1. The *brunneus* group, which is closely related to *Protogcodes paramonovi*, apparently gave rise to the more widespread *eugonatus* group. However, these two groups are presently widely separated geographically, and this might give the impression that their relationship is superficial. It seems likely that members of the *eugonatus* group will be found to occur in the Oriental region. Also, it seems likely that more species occur in the Ethiopian and Australian regions than is known at present, but the absence of material and the lack of adequate descriptions of genitalia and wing venation of the known species from the intervening areas prevent me from assigning many of the known species to this or other species groups. The Holarctic *borealis* group appears to be a rare, primitive one, which probably gave rise to both the *colei* and *pallidipennis* groups, the latter being the most common and widespread group of the subgenus. The *colei* group is not homogeneous, and might better be divided into two or three groups based primarily on wing venation and structure of the ejaculatory apodeme. However, enough characteristics seem to hold true for all the included species to maintain it as a single varied group at the present time.

The *pallidipennis* group is quite homogeneous, and although in some respects it seems to be more primitive than the *colei* group, it is certainly far more catholic in its adaptability. For example, there are as many species of the *colei* group in New Zealand as in all of the Nearctic region. A possible explanation for this might be that since the *pallidipennis* group is represented commonly in the latter region by no less than eight species, but is absent in New Zealand, there would appear to be no competition there, and thus the members of the *colei* group are not uncommon; whereas, in the Nearctic region, members of the latter group are extremely rare, while those of the *pallidipennis* group are the most abundant. It might be inferred that competition for the same hosts (as pointed out earlier in the biology section) among the various species of *Ogcodes* is one of the major factors in the "rareness" of some of the species.

It seems quite probable that some member of the *colei* group (possibly *vittisternum* Sabrosky) gave rise to *albiventris* (Johnson), which is now the monotype of the Nearctic subgenus *Neogcodes*. The *porteri* group remains a spurious one at present but is apparently most closely related to species of the *eugonatus* group.

Group I—*brunneus* group

DIAGNOSIS: Veins M_1, M_2, M_4, Cu_2, A, and crossveins m-cu and r-m present (pl. 3, fig. 8); median plate of ejaculatory apodeme either expanded basally (pl. 11, fig. 75) or not; basal cell of apodeme round, incomplete ventrally; apodemal wings short and median plate of medium size (pl. 12, fig. 83); aedeagus somewhat narrowed or broadened at apex, with small or no postgonoporal notch; body pile rather even and not extremely long; terminal antennal segment with one to three small apical setae; abdomen with typical fasciae on tergites (pl. 5, fig. 29).

INCLUDED SPECIES: *O. brunneus* (Hutton) and *consimilis* Brunetti.

Group II—*eugonatus* group

DIAGNOSIS: Vein M_1 absent, except sometimes faintly visible at apex; crossvein m-cu absent (pl. 4, figs. 18, 19); ejaculatory apodeme with short wings and incomplete basal and subbasal cells (pl. 11, fig. 78); median plate in lateral view narrow, nearly equi-breadth, directed anteriorly (pl. 12, figs. 91, 93, 94); aedeagus blunt apically, flat subapically, without postgonoporal notch (pl. 10, fig. 69; pl. 11, figs. 71, 73); apex of antenna usually with one seta; body pile of medium length and quite even; abdomen fasciated (pl. 5, fig. 29) or sometimes patterned. This group was partly defined by Sabrosky (1948, p. 410) as "#3, *eugonatus* complex."

Included species: *O. caffer* Loew, *chilensis* Sabrosky (?), *eugonatus* Loew, *guttatus* Costa, *melampus* Loew, *nigripes* Zetterstedt, and *zonatus* Erichson.

Group III—*borealis* group

Diagnosis: Veins M_1, M_2, M_4, Cu_2, A, and crossveins m-cu and r-m present (pl. 3, fig. 7); ejaculatory apodeme with median plate of medium size, short wings, and well-defined basal and subbasal cells (pl. 11, figs. 72, 76); aedeagus either blunt apically with large pregonoporal and postgonoporal notches (pl. 9, fig. 56), or narrowed, curved and rounded without postgonoporal notch (pl. 8, fig. 51); body pile rather short, not dense; apex of antenna with two or three short setae; abdomen fasciated somewhat (pl. 5, fig. 29). This group was partly defined by Sabrosky (1948, p. 410) as "#2."

Included species: *O. borealis* Cole and *pallipes* Latreille.

Group IV—*colei* group

Diagnosis: Vein M_1 usually present together with crossvein m-cu; however, M_1 or m-cu may be present alone in some species, but both veins are not totally absent (pl. 3, figs. 9, 12; pl. 4, figs. 14, 21); ejaculatory apodeme weakly developed, often inconspicuous (pl. 12, figs. 95–98), or sometimes developed about as well as in species of the *eugonatus* group (pl. 12, figs. 84, 87–90); basal and subbasal cells, when present, weakly defined (pl. 11, figs. 77, 79); aedeagus usually slender and rather acuminate apically with or without large pregonoporal and postgonoporal notches (pl. 6, fig. 31; pl. 9, figs. 52–55, 57–59; pl. 10, figs. 61–64; body pile unusually long in most species, others with only patches of long pile on several tergites; apex of antenna with two or three short setae; abdomen often very colorfully patterned (pl. 5, fig. 30), rarely only with simple fasciae (pl. 5, fig. 29). This group was partly defined by Sabrosky (1948, p. 410) as "#4, *colei* complex."

Included species: *O. argigaster,* new species, *colei* Sabrosky, *floridensis* Sabrosky, *fortnumi* Westwood, *hirtus* Sack, *kuscheli* Sabrosky, *leptisoma,* new species, *nitens* (Hutton), *pygmaeus* White, *shewelli* Sabrosky, *similis,* new species, and *vittisternum* Sabrosky.

Group V—*pallidipennis* group

Diagnosis: Veins M_1, M_2, M_4, Cu_2, A, and crossvein r-m present; crossvein m-cu absent, or at most a faint trace (pl. 3, figs. 10, 11, 13; pl. 4, fig. 20); ejaculatory apodeme well developed; median plate and wings large; basal cell large, complete or incomplete ventrally, subbasal cell high, but thin and rather inconspicuous (pl. 6, figs. 32, 33;

pl. 11, fig. 80; pl. 13, figs. 99–112); aedeagus variable in shape, ranging from being quite curved near apex and ending in rounded tip (pl. 7, figs. 34–40; pl. 8, figs. 46, 47) to being somewhat truncate at apex (pl. 7, figs. 41, 42; pl. 8, figs. 43–45, 48), or rarely being almost pointed apically (pl. 8, fig. 50); commonly the apex has a small postgonoporal notch and a large, gently curving, pregonoporal notch, but the reverse also occurs; body pile short, even, obscure in some species; apex of antenna usually with one seta; abdomen usually with typical fasciae (pl. 5, fig. 29), but some species are maculated. This group was partly defined by Sabrosky (1948, p. 409) as "#1, *pallidipennis* complex."

INCLUDED SPECIES: *O. basalis* (Walker), *clavatus* Becker, *dispar* (Macquart), *dusmeti* Arias, *gibbosus* (Linnaeus), *pallidipennis* Loew, *reginae* Trojan, *rufoabdominalis* Cole, *varius varius* Latreille, *varius pallidimarginalis* Brunetti, *varius siberiensis* Brunetti, and the following new species: *adaptatus*, *argentinensis*, *boharti*, *brasilensis*, *canadensis*, *colombiensis*, *hennigi*, *orientalis*, *philippinensis*, and *sabroskyi*.

Group VI—*porteri* group

DIAGNOSIS: Veins M_1, M_2, M_4, and crossveins m-cu and r-m absent; anal area greatly reduced as is vein R_{4+5}; vein R_1 and costa also shortened (pl. 4, fig. 16); male genitalia have not been examined in the only known specimen; body pile short and sparse; antennal structure unknown; male abdomen patterned as in some species of *Acrocera* with sinuated fasciae.

INCLUDED SPECIES: *O. porteri* Schlinger.

Ogcodes (*Ogcodes*) species of Australian subregion

As Paramonov has prepared a revision of the Australian Acroceridae (in press)[7], I shall not attempt to deal with this fauna at any great length at this time. Sixteen species have been recorded from Australia and Tasmania. From Australia: *basalis* (Walker), *castaneus* Brunetti, *darwinii* Westwood, *doddi* Wandolleck, *fortnumi* Westwood, *fratellus* Brunetti, *fraternus* Brunetti, *ignava* Westwood, *insignis* Brunetti, *variegatus* Brunetti, *victoriensis* Brunetti. From Tasmania: *ater* White, *flavescens* White, *nigrinervis* White, *pygmaeus* White, and *tasmanica* Westwood.

From this study it appears that at least three species groups are present in this region; namely, the *pallidipennis*, *colei*, and possible the *brunneus* groups. Also, I have seen one female specimen of an undetermined species in the new subgenus *Protogcodes* from Australia.

[7] Since completion of my work, Paramonov's paper (1957) has been published. See appendix and bibliography.

Ogcodes (*Ogcodes*) *basalis* (Walker)

Plate figures 46, 101

Henops basalis Walker, Ins. Saunders. Dipt., vol. 1, p. 203, 1852.

Oncodes basalis, Hardy, in part, Pap. Proc. Roy. Soc. Tasmania for 1917, pp. 60–61, 1918.—Brunetti, Ann. Mag. Nat. Hist., vol. 18, p. 599, 1926.

Oncodes basilis, Hardy, in part, Pap. Proc. Roy. Soc. Tasmania for 1917, pp. 60–61, 1918; in part, Pap. Proc. Roy. Soc. Tasmania for 1921, p. 78, 1940; in part, Proc. Linn. Soc. New South Wales, vol. 45, pp. 486–487, 1940.

Type locality: New South Wales, Australia (1♂, BMNH).

Diagnosis: This species is a member of the *pallidipennis* group. The males are typically brightly tricolored, black, orange, and white; the females typically quadricolored, black and brown with some orange and white markings. Both sexes have posterior white tergal fasciae and a black thorax. The wings may be infuscated or nearly clear. The female abdomen is mostly brown above, white below, while the male is white below and the dorsum is orange with median and lateral black spots (sometimes with a brownish tinge), the former usually on tergites II–IV, the latter on II–VI. The legs of the male are bright orange except for browned coxae, basal one-half of femora, and tarsi, while the female legs are mostly dark brown to black, but usually with orange markings on knees and apex of tibiae. Vein M_1 and crossvein r-m are strong. The male genitalia resemble those of several species of the group, but are actually most similar to *varius* Latreille and *philippinensis*, new species (see pl. 13, figs. 99, 101, 109).

Discussion: The identity of this species has been often confused since its description by Walker. Hardy (1918) synonymized nine species under *basalis* of which five were from Tasmania, and in 1922 he added one more to the list. Brunetti (1926) examined the holotype of *basalis*, but, strangely enough, compared it only with his Ceylonese species, *rufomarginatus*, and thus his discussion is of little use here. Hardy (1940), in a brief synopsis of the Australian species, concluded that all the species except *variegatus* Brunetti were merely color variants of *basalis* (as *basilis*), a conclusion based on limited material and superficial characters. Plomley's (1947a, 1947b) interesting works on the biology and taxonomy of *basalis* actually dealt with *pygmaeus* White. He also had specimens of *fortnumi* Westwood from the same locality, but did not figure the latter species. This misidentification became apparent by an examination of several of his specimens which had been determined by Paramonov as either *pygmaeus* or *fortnumi*.

It seems probable that *darwinii* Westwood is a synonym of *basalis*, but this will have to await an examination of the types. Aside from other possible Australian relatives, *basalis* is related to *philippinensis*,

new species, *varius* Latreille, and *orientalis*, new species. I have seen a male specimen of what is probably a new species from Olokemeji, Ibadan, Nigeria, West Africa (Bridwell, USNM), which is similar to *basalis*, and both this species and *varius* Latreille show that relatives of *basalis* occur quite a distance from the Australian region.

SPECIMENS EXAMINED: 3 ♂, 6 ♀.

AUSTRALIA: 1 ♂, Sydney, September 1915 (Bridwell, USNM); 2 ♀, Sydney, Aug. 2, 1903 (USNM); 1 ♀, Aralong, Buccleugh (T. Vaughn-Sherrin, USNM); 1 ♀, Coonabarabran District, New South Wales, Sept. 23, 1936 (K. H. L. Key, SJP) [det. as *darwini* by Paramonov]; 1 ♀, Donnybrook, West Australia, Sept. 13, 1938 (K. R. Norris, SJP); 1 ♂, Canberra, Feb. 3, 1951 (K. H. L. Key, SJP); 1 ♂, Acacia Plat., New South Wales (J. Armstrong, SJP) [det. as *darwini* by Paramonov]; 1 ♀, New South Wales (#514, Hy. Edwards Collection, AMNH).

Ogcodes (Ogcodes) pygmaeus White

PLATE FIGURES 58, 77

Oncodes pygmaeus White, Pap. Proc. Roy. Soc. Tasmania for 1914, p. 72, 1915.
Oncodes basalis, Plomley, Rec. Queen Victoria Mus., vol. 2, pp. 17–22, figs. 1–5, 1947a; in part, Rec. Queen Victoria Mus., vol. 2, pp. 23–30, 1947b (not Walker, 1852).

TYPE LOCALITY: Launceston, Tasmania (1♀, Littler Collection, South Australian Museum).

DISCUSSION: *O. pygmaeus* is a member of the *colei* group. This small mostly brown species is closely related to *fortnumi*. It has characteristics of *nitens* (Hutton) from New Zealand, and may also possibly be close to the Tasmanian species *flavescens* White, which, judging from its original description, appears to belong in the *colei* group. The thorax in both sexes of *Ogcodes pygmaeus* is shining black and covered with fairly long brown pile. The abdomen of the male has long pile on tergites II and III, and the genitalia resemble those of *fortnumi* and *nitens*. The legs and abdomen are light and dark brown in the male and mostly dark brown in the female. Vein M_1 is present though faint throughout and ends in a long curve close to the wing margin well beyond vein R_{4+5}. Crossvein m-cu is present but faint, crossvein r-m is absent. The genitalia were figured by Plomley (1947a, figs. 1–5) under the name of *basalis* Walker. The aedeagus has been redrawn here (pl. 9, fig. 58). The ejaculatory apodeme in lateral view appeared identical to that of *fortnumi* (pl. 12, fig. 84); however, it was quite different from the latter species in anterior view (compare pl. 11, figs. 74 and 77).

SPECIMENS EXAMINED: 1 ♂, 1♀.

AUSTRALIA: 1 ♂, 1 ♀, Upper Blessington, *Tasmania*, Feb. 6, 1936 (J. J. B. Plomley, SJP) [det. by Paramonov].

Ogcodes (*Ogcodes*) *fortnumi* Westwood

PLATE FIGURES 57, 74, 84

Ogcodes fortnumi Westwood, Trans. Ent. Soc. London, p. 516, 1876.
Oncodes basalis, Plomley, in part, not figures, Rec. Queen Victoria Mus., vol. 2, pp. 17–22, 1947a; in part, Rec. Queen Victoria Mus., vol. 2, pp. 23–30. 1947b (not Walker, 1852).

TYPE LOCALITY: Adelaide, Australia (Hope Museum).

DISCUSSION: This species belongs in the *colei* group and is similar to *pygmaeus*, described above; however, I am not certain as to the identity of this species since the only specimens available for study were from Tasmania, not Australia. They were determined as *fortnumi* by Paramonov, and formed part of the series reported on by Plomley (1947a, 1947b). It should be noted that his specimens of *pygmaeus* White (as *basalis*) were collected on Feb. 6, 1936, while those of *fortnumi* were collected on Mar. 6, 1936, and thus they did not necessarily represent one population. Although Plomley (1947a, pp. 20–21) noted considerable variation in his large series of Upper Blessington specimens, he followed Hardy (1918, 1940) and was misled in assuming that his specimens were all *basalis*. Actually it is very doubtful that *basalis* was represented in his series at all.

On the basis of male genitalia there is little doubt that *fortnumi* is closely related to *pygmaeus* White (see pl. 9, figs. 57–58). It is also similar to *nitens* (Hutton), and has certain affiliations with *borealis* Cole and *kuscheli* Sabrosky (see pl. 9, figs. 52, 56–57, 59; pl. 11, fig. 79; pl. 12, figs. 84, 88).

SPECIMENS EXAMINED: 2♂, 1♀.

AUSTRALIA: 1♂, 1♀, Upper Blessington, Tasmania, Mar. 6, 1936 (N. J. B. Plomley, SJP); 1♂, Perth, Feb. 25 to Mar. 12, 1936 (R. E. Turner, BMNH).

Ogcodes species of New Zealand subregion

Key to the New Zealand species of genus *Ogcodes* [8]

1. Vein M_1 faintly present or only a crease; dorsum of abdomen with white markings other than fasciae 2
   Vein M_1 present, usually as dark as R_{4+5}, sometimes clear, but always vein-like; dorsum of abdomen without white markings except when fasciae are present 3
2. Entire abdomen white except for brown tergites I and VI, median spot on II, and posterior margin of V; tibiae and tarsi mostly yellow or white.
   argigaster, new species

[8] Females of (*O.*) *argigaster*, (*O.*) *leptisoma*, (*O.*) *similis*, and (*Protogcodes*) *paramonovi* have not been examined. Females of (*O.*) *brunneus* and (*O.*) *consimilis* will probably key out together (see discussion under *brunneus*).
Paramonov's (1955, p. 23) key to the *Oncodes* of New Zealand is misleading in several points and caution should be exercised in using it. Only the males of *consimilis* will key out correctly.

Tergites dark brown except for large white mesolateral spots on tergites III and (usually) IV; venter with some indication of brown anterior fasciae on all sternites; tibiae and tarsi mostly brown . . . . **nitens** (Hutton)

3. Wing distinctly and evenly infuscated; anal vein joins vein Cu_2 far before hind wing margin; abdomen with dense, nearly appressed, silvery, short pile on tergites II and III laterally . . . . **leptisoma,** new species

   Wing mostly hyaline; anal vein does not reach vein Cu_2; abdomen without silvery pile as indicated above 4

4. Frons without pile; tergites with normal posterior white fasciae 5

   Frons well developed and with long pile; tergites black to dark brown without white posterior fasciae except narrowly on IV and V.
   (Protogcodes) paramonovi, new species

5. Body covered with brown pile; abdomen with medial clumps of pile on tergites II–IV and lateral clumps on IV–VI . . . . **similis,** new species

   Body covered with whitish yellow pile; abdomen without clumps of pile . . . 6

6. Abdomen usually with tergites I and II black, the remainder brown in the males; legs mostly light brown . . . . **consimilis** Brunetti

   Abdomen rather concolorous dark brown or black; legs mostly dark brown.
   brunneus (Hutton)

Ogcodes (*Ogcodes*) *brunneus* (Hutton)

Plate figures 8, 68, 82

Henops brunneus Hutton, Cat. Dipt. New Zeal., p. 24, 1881.—Maskell, Trans. New Zealand Inst., vol. 20, pp. 106–108, pl. 10, 1888.—Hutton, Trans. New Zealand Inst., vol. 33, p. 29, 1901.

Oncodes brunneus, Brunetti, Ann. Mag. Nat. Hist., vol. 18, p. 593, 1926.—Dumbleton, New Zealand Journ. Sci. Tech., vol. 22 (sec. A), pp. 97a–101a, figs. 1–5, 1940.—Paramonov, Pacific Sci., vol. 9, p. 23 (=*brunneus*?), 1955.

Type locality: Lake Wanaka, Otago, South Island, New Zealand (Canterbury Museum, New Zealand).

Diagnosis: Species of group I with typical white abdominal fasciae, otherwise whole body dark brown to black and covered with moderately long, whitish yellow pile except median portion of tergites IV–VI of male; wing hyaline, veins mostly clear except costa and radius brown; vein M_1 and crossveins m-cu and r-m present but rather pale (pl. 3, fig. 8); squama snowy white, opaque, narrowly margined light or dark brown, halter mostly light brown; male genitalia dark brown, median plate long and narrow in lateral view (pl. 11, fig. 82); basal cell large, subbasal cell small, "wings" short, aedeagus expands toward apex, which is narrowly rounded (pl. 10, fig. 68).

Discussion: It seems clear that *consimilis* Brunetti is closely related to *brunneus,* but the genitalia easily separates the two. However, I have been unable to find any specific differences between the females of the two species. I have seen several specimens of what appeared to be *brunneus,* but only one of these was a male, and thus the genitalic character mentioned above may be more variable than noted. Other male specimens that had tentatively been considered to be

brunneus on the basis of their coloration were found to be *consimilis* on the basis of their genitalia. Thus, some confusion still exists between these two species.

Brunetti (1926) apparently had at least three species included under *brunneus*, and thus his distribution records should be queried. Certainly his remarks about the specimen from "Gollans Valley" refer to *nitens* (Hutton), unless it was a female, in which case it may possibly have been *argigaster*, new species. Brunetti compared his *consimilis* to *basalis*, a species which has never been recorded from New Zealand. If he had compared it to *brunneus* he would have no doubt seen the great similarity between the two species. Judging from Paramonov's (1955) key and from the writings of Hutton and Maskell, *brunneus* of Paramonov was not the same as that of Hutton (1881, 1901) unless Paramonov had an extremely dark example. A solution to the identity of these two species becomes more complex because specimens of both "species" that were collected on the same day at Ohakune, New Zealand, have been examined. Also, if the type specimen of *brunneus* should be a female, as I suspect it is, the problem of knowing the true identity of these two species will become even more acute.

Maskell (1888) and Dumbleton (1940) have described and figured the first-instar larva of *brunneus*, and Dumbleton recorded *Matachia ramulicola* Dalmas as a host.

Specimens examined: 1 ♂, 8 ♀.

New Zealand: Ohakune, Wellington, North Island, 1 ♂, Jan. 15, 1920 (T. Harris, USNM); 6 ♀, January 1924 (T. R. Harris, BMNH); 2 ♀, March 1922 (T. Harris, USNM, EIS).

Ogcodes (*Ogcodes*) *consimilis* Brunetti

Plate figures 67, 75, 83

Oncodes consimilis Brunetti, Ann. Mag. Nat. Hist., vol. 18, p. 603, 1926.—Paramonov, Pacific Sci., vol. 9, p. 24, 1955.

Type locality: Mount Ruapehu, North Island, New Zealand (♂ ?, BMNH).

Diagnosis: A species of group I that differs from *brunneus* only in the male as follows: Tergites I and II typically black, rather shining, other tergites dark brown; male genitalia with aedeagus much narrower and more pointed at apex (pl. 10, fig. 67); ejaculatory apodeme of different shape (pl. 11, fig. 75; pl. 12, fig. 83), median plate with rodlike swelling.

Discussion: As brought out under *brunneus*, there is some confusion about the distinctness of *consimilis* and the former, but several typical males have been examined from Kumara and Blackhall. On the other hand, a topotypical male of *consimilis* had some of the

characteristics of *brunneus* and might have been determined as the latter species except for the genitalic features.

SPECIMENS EXAMINED: 8 ♂, 5 ♀.

NEW ZEALAND: North Island: 4 ♂, 1 ♀, Ohakune, Wellington, Dec. 25, 1919, Jan. 10–15, 1920, March 1922 (T. R. Harris, USNM, EIS); 1 ♀, Silverstream, Wellington, Dec. 3, 1936 (USNM); 1 ♂, Eglinton Volcano, Dec. 31, 1920 (Fenwick, USNM); 1 ♂, (topotype), Jan. 7, 1922 (Fenwick, USNM). South Island: 2 ♂, 2 ♀, Kumara, Westland, Dec. 14–15, 1929, Jan. 7, 1930 (J. W. Campbell, USNM, EIS); 1 ♀, Greymouth, Westland (EIS).

Ogcodes (*Ogcodes*) *similis*, new species

PLATE FIGURES 55, 87

Species of group IV.

MALE: Length of entire specimen 4.50 mm., wing length 4.00 mm.

Head dark brown except for black occiput, frons, and oral area; ocellar tubercle small; frons narrow, no wider than ocellar tubercle, flat, not protruding, grooved medially; antenna with segments I and II appearing fused, III only slightly swollen basally, long, thin, with two short apical setae; mouth area oval, proboscial cover yellow.

Thorax shining black, covered with reddish brown pile about as long as antennal segment III; legs slender, coxae black, femora dark brown, remainder light brown; wing hyaline, veins light brown and faint; vein M^1 and crossvein m-cu present but faint, vein Cu^2 does not meet anal vein, stops just short of wing margin, venation similar to that shown in plate 3, figure 8; squama delicate, base and narrow rim brown, transparent but most of central area whitish, halter stem brown, knob broken off.

Abdomen dark brown except for narrow posterior white fasciae on tergites II–VI, somewhat larger fasciae on sternites III–V, and white pleural membrane; dorsum covered with short, sparse brown pile with longer clumps of pile on medial area of tergites II–IV and lateral areas of IV–VI; venter covered with short, sparse brown pile except for sternite I.

Genitalia small, aedeagus narrowed and notched apically (pl. 9, fig. 55); ejaculatory apodeme of medium build, directed anteriorly, median plate about as wide as long in lateral view (pl. 12, fig. 87).

FEMALE: Unknown.

HOLOTYPE: Male, New Zealand, 1928 (G. V. Hudson, BMNH, 1948–73).

REMARKS: This species is related to *nitens, pygmaeus,* and *argigaster,* being perhaps most closely associated with the Tasmanian *pygmaeus.* It is easily separated from these species by the structure of the male genitalia (compare pl. 9, figs. 52, 53, 55, 58; pl. 12, figs. 87, 89, 90) and the features given in the key above.

***Ogcodes (Ogcodes) leptisoma*, new species**

PLATE FIGURES 61, 95

Species of group IV.

MALE: Length of entire specimen 5.50 mm., wing length 4.50 mm. Head dark brown except black occiput; ocellar tubercle small, hardly protruding, frons small, no wider than ocellar tubercle, flat, not protruding, grooved medially; antenna with segments I and II appearing fused, III only slightly swollen basally, very long and thin, with two apical setae; mouth area oval, quite narrow.

Thorax shining black, only pleura dark brown, entirely covered with whitish yellow pile about as long as antennal segment III; legs slender, especially tarsal segments, but apices of both hind femur and tibia swollen, dark brown except femora and most of tibiae yellow; wing evenly infuscated, veins dark brown, vein M_1 and crossvein m-cu present and distinct, anal vein joins Cu_2 before hind wing margin, though faint at junction; squama rugose, opaque, dark brown infuscated, halter knob brown with white markings, stem light brown.

Abdomen dark brown except for narrow, pale, yellowish brown posterior fasciae on tergites I–VI, sternites II–VI brownish yellow with wide posterior fasciae on II and III, and pleural membrane white; dorsum with short, silvery, nearly appressed pile on posterior two-thirds of tergite I, all of II, and small mesolateral area of III; long, brown pile present along lateral margin of all segments and large mesolateral area of tergite V, short brown pile along midline of tergites II and III, and most of IV; median area of V and all but margin of VI bare of pile and shining; venter evenly covered with short yellowish brown pile except for bare and shining sternite I; spiracles of segments II–IV appearing as brown spots in white membrane.

Genitalia dark brown, small, aedeagus slender, nearly acuminate (pl. 10, fig. 65); ejaculatory apodeme without definite median plate, the whole apodemal structure minute with small spiculae below and on wings (pl. 12, fig. 95).

FEMALE: Unknown.

HOLOTYPE: Male, Queenstown, Otago, South Island, New Zealand, Dec. 12, 1922 (Leon Curtis, USNM 64438).

PARATYPES: 3 ♂, all New Zealand; 1 ♂, Glenorchy, Jan. 3, 1923 (F. S. Oliver, EIS); 2 ♂, Wilton's Bush, Wellington, Dec. 6, 1920 (G. V. Hudson, BMNH, 1923–323).

The holotype's abdomen apparently was damaged somewhat during its capture, so the characteristic shape of the abdomen is noted from the paratypes as follows: In dorsal view, segments II, III, and IV are of equal length and width, and together make up about three-fourths the length of the abdomen; in lateral view, the venter is shallowly

concave, and the dorsum is highly arched with its highest point at the junction of tergites III and IV. Otherwise the paratypes agree with the holotype.

Remarks: Although *leptisoma* is somewhat similar to *pygmaeus* White from Tasmania, the two can easily be separated by the male genitalia. Closest relatives appear to be the Nearctic species *vittisternum* Sabrosky, *shewelli* Sabrosky, and *colei* Sabrosky, as noted by structures of the male genitalia (compare pl. 10, figs. 61–64 and pl. 12, figs. 95–98). There is no known close relative in New Zealand. The name *leptisoma* refers to the scale-like pile of the abdomen.

Ogcodes (*Ogcodes*) *argigaster*, new species

Plate figures 14, 53, 89

Species of group IV.

Male: Length of entire specimen 6.10 mm., wing length 6.00 mm.

Head dark brown except for black occiput; ocellar tubercle small, hardly protruding, frons large, protruding and depressed medially; apex of terminal antennal segment with two minute setae; mouth area oval.

Thorax shining black, covered with long whitish yellow pile about as long as antennal segment III; legs slender, only apex of hind femur swollen, coxae, trochanters, knees, last tarsal segment and claw dark brown, femora infuscated, tibiae and remainder of tarsi whitish yellow; wing transparent, veins white; vein M_1 present but crease-like, not distinct, crossvein m-cu present, r-m crossvein faint, indistinct, anal vein separated from Cu_2 at wing margin (pl. 4, fig. 14); squama vertically raised near base, arched throughout, white with thin yellow margin, halter knob dark brown, stem lighter brown.

Abdomen opaque white except for dark brown on most of tergite I, small median spot on II, all of IV, lateral margin of sternite I, genitalia and spiracles; posterior portion of segments II–IV with narrow yellow margins; tergites covered with long white pile along lateral margins and median area of II to the base of IV, with short, dense, downy pile on mesolateral part of tergite II, otherwise dorsum shining and bare; venter covered with long pile on middle two-thirds of each sternite throughout its width except sternite II with somewhat longer pile and I bare.

Genitalia small, aedeagus pointed apically with large, postgonoporal notch; aedeagal sheath long, reaching out near tip of aedeagus (pl. 9, fig. 53); ejaculatory apodeme of medium build, median plate directed anteriorly (pl. 12, fig. 89).

Female: Unknown.

Holotype: Male, Cass, New Zealand (USNM 64439); 1♂, paratopotype (USNM).

The paratopotype agrees essentially with the holotype, differing only in having a little more brown on the abdomen as follows: a small median spot on tergite III, and most of the posterior two-thirds of V. The paratype is 7.00 mm. long; its wing length 6.70 mm.

REMARKS: This species is closely related to *nitens* (Hutton), but is easily separated by the lighter coloration, larger size, and structure of the male genitalia (see pl. 9, figs. 52–53; pl. 12, figs. 89–90). The Nearctic species *colei* Sabrosky shows a very close resemblance to this new species but differs mainly in the characters cited above for *nitens*. The name *argigaster* refers to the white abdomen.

Ogcodes (*Ogcodes*) *nitens* (Hutton)

PLATE FIGURES 52, 79, 90

Henops nitens Hutton, New Zealand Inst. Trans., vol. 33, p. 29, 1901.
Oncodes brunneus, Brunetti, in part (?), Ann. Mag. Nat. Hist., vol. 18, p. 594, 1926.
Oncodes nitens, Paramonov, Pacific Sci., vol. 9, p. 24 (?), 1955.

TYPE LOCALITY: Auckland and Wellington, New Zealand (Canterbury Museum, New Zealand).

DIAGNOSIS: Species of group IV. Male with brown and white maculated abdomen.

Thorax shining black, covered with long dense whitish brown pile which appears dark brown at its base; legs mostly dark brown, tibiae and tarsi somewhat lighter brown; wing transparent, wing veins pale, vein M_1 a faint crease, crossvein m-cu present, r-m crossvein absent; squama opaque white, hyaline near margin which is narrowly brownish yellow.

Abdomen shining dark brown except usually for posterior margins of sternites, posterior lateral margin of tergite II, large mesolateral spots on III and IV, and narrow posterior fasciae on II–V which are white to brownish white; dorsum covered with long white pile along lateral margins and median area of tergites II–IV, with short white pile on mesolateral area of tergite II, remainder of abdomen mostly bare and shining.

Genitalia small, aedeagus pointed apically (pl. 9, fig. 52); ejaculatory apodeme with long, narrow median plate in lateral view (pl. 12, fig. 90); wings bent downwards (pl. 11, fig. 79).

DISCUSSION: This species has never been clearly defined and Hutton's description (1901) is entirely too brief to be useful. Paramonov (1955) saw no specimens of *nitens*, and to my knowledge no records since Hutton have been given. Paramonov's key to the New Zealand species was erroneous as he contended that both the abdomen and its pile were black, whereas Hutton (1901, p. 29) clearly stated ". . . a spot on each side of the second and third abdominal segments, tawny." The specimens examined by me, and upon which

the above diagnosis was made, were all males, and fit Hutton's description except that the abdomen was brown and white instead of black and tawny. It seems probable that Hutton had only female specimens, which perhaps are darker than the males, as found in many species of *Ogcodes*.

Brunetti (1926, p. 594) cited a specimen of *brunneus* (Hutton) from "Gollans Valley, 24. xii. 1921 (G. V. Hudson)," and commented that "the specimen from Gollans Valley has a pale, irregularly-shaped spot of some size, but with indefinite outline towards each side margin on the third segment." This specimen was very likely *nitens*, as one of the males I have seen had only one lateral spot instead of the usual two.

The resemblance of *nitens* to *shewelli* Sabrosky from the eastern United States is striking, and there seems to be little doubt that the two are related in spite of their geographical separation. In New Zealand, the new species *argigaster* and *similis* appear to be the only close relatives of *nitens*.

Specimens examined: 7 ♂, 2 ♀.

New zealand: 3 ♂, 1 ♀ (without abdomen) and 1 ♀ ♂ (in copula), Port Hills. Dec. 2, 1923 (J. W. Campbell, USNM, EIS); 2 ♂, Casmere, Jan. 3, 1922 (T. R. Harris, USNM); 1 ♂, Governor's Bay, Dec. 2, 1923 (J. W. Campbell, USNM),

Ogcodes species of Polynesian subregion

The only species known from this area are *costalis* (Walker), *javanus* Meijere, and *trifasciatus* Meijere. As I have not seen any specimens from this subregion, the assignment of the species to species groups and their specificity will have to await further study. See the list of species (p. 316) for further notes and references.

Ogcodes species of Ethiopian region

The following 11 species and subspecies have been recorded from this area: *alluaudi* Becker, *caffer* Loew, *clavatus* Becker, *coffeatus* Speiser, *congoensis* Brunetti, *crassitibialis* Brunetti, *distinctus* Brunetti, *neavei* Brunetti, *nyasae* Brunetti, *trilineatus* Brunetti, and *varius pallidimarginalis* Brunetti.

To my knowledge no one has attempted to revise the African species, but two of the most comprehensive works were those of Brunetti (1926) and Sabrosky (1950).

From Brunetti's description of *distinctus* (1926) it seems very possible that he had a specimen of *guttatus* Costa, which at that time was not known to occur in Africa. This latter name should now be added to the above list of Ethiopian species (see discussion under

guttatus). Likewise it seems that *crassitibialis* Brunetti may be *clavatus*, while *sorellus* Brunetti was found to be a synonym of *caffer* Loew. Thus, a tentative estimate of the number of Ethiopian *Ogcodes* species is 12.

Although specimens representing at least four species have been examined, only two of these can be properly determined and discussed at this time.

Ogcodes (*Ogcodes*) *caffer* Loew

Plate figures 19, 69, 93

Oncodes caffer Loew, Vet. Akad. Forhand., vol. 14, p. 368, 1857; Dipt. Sudafrika, p. 255, 1860.

Oncodes sorellus Brunetti, Ann. Mag. Nat. Hist., vol. 18, p. 603, 1926. New synonymy?

Type locality: Africa: Caffrerei, *caffer;* and Natal, *sorellus.*

Discussion: This species is a member of group II. The examination of seven specimens from South Africa, which fit Loew's description of *caffer* well, were compared with the original description of *sorellus*, and no significant differences could be found. Brunetti was apparently unaware of *caffer* when he described *sorellus*, just as he ignored nearly all the described species of the genus at the time of his publication (1926). As pointed out by Sabrosky (1950) and by this author under various species in the text, it seems probable that many of Brunetti's species may fall into synonymy as they become better known.

The species *caffer* appears to be more closely related to the Palaearctic *zonatus* Erichson and the Nearctic *eugonatus* Loew than to any other known species. The abdominal pattern of the latter species was nicely drawn by Cole (1919, pl. 15, fig. 42) as *marginatus* Cole, and serves to illustrate the pattern of *caffer*. The slight differences noted in the wing venation among these three related species are shown in plate 4, figures 18, 19, and differences in male genitalia are shown in plate 10, figure 69; plate 11, figures 71, 73; plate 12, figures 93, 94. Otherwise the description of *caffer* fits that given for *eugonatus* (see below).

Specimens examined: 6♂, 1♀.

South africa: 2♂, 1♀, Cape Province, Matjesfontein, Oct. 6–15, 1926 (R. E. Turner, BMNH, EIS); 4♂, Cape Town, Milnerton, January 1926 (R. E. Turner, BMNH).

A female from Cape Province, Swellendam, February 1932 (R. E. Turner, BMNH), also was examined. It belongs in the *eugonatus* group, but apparently is distinct from *caffer*, at least by its general coloration.

Ogcodes (*Ogcodes*) *clavatus* Becker

Plate figures 10, 48, 110

Oncodes clavatus Becker, Bull. Mus. Hist. Nat. Paris, vol. 15, No. 3, p. 113, 1909; Ann. Soc. Ent. France, vol. 79, p. 22, 1910.

Oncodes cepisetis Speiser, *in* Sjostedt, Kilimandjaro-Meru Exped., vol. 2, part 10, No. 4, p. 74, 1910 [synonymy by Sabrosky, 1950].

(?) *Oncodes nyasae* Brunetti, Ann. Mag. Nat. Hist., vol. 18, p. 598, 1926 [synonymy by Sabrosky, 1950].

Oncodes crassitibialis Brunetti, Ann. Mag. Nat. Hist., vol. 18, p. 602, 1926. New synonymy?

Ogcodes clavatus, Sabrosky, Proc. Roy. Ent. Soc. London, vol. 19, p. 51, 1950.

Type locality: Africa: British East Africa, *clavatus;* Mt. Meru, *cepisetis;* Nyasaland, *nyasae;* and East Africa, *crassitibialis.*

Discussion: This species belongs in group v. Sabrosky (1950) has given a good account of the variation occurring in *clavatus*. In examining part of his observed series of *clavatus*, as compared to the original description of *crassitibialis* Brunetti, I conclude that the latter species is very likely a synonym of *clavatus*.

Although *clavatus* is surely a member of the *pallidipennis* group, the male genitalia show it to be set apart somewhat from all other species of the group (see pl. 8, fig. 48, pl. 13, fig. 110). The wing also shows a definite group relationship; however, it is one of the few species seen that has the r-m crossvein perpendicular to the costa (see pl. 3, fig. 10).

The relationships of *clavatus* to other species are not fully understood, but colorwise it resembles *guttatus* Costa. However, the latter is a member of the *eugonatus* group and is therefore not closely related phylogenetically. Perhaps such species as *congoensis*, *neavei*, and *trilineatus* (all Brunetti, 1926) will be found to be associated species.

Specimens examined:

East Africa: 5♂, Naivasha, Kenya, July 1937, September 1939, and April 1940 (H. J. A. Turner, USNM, EIS).

Ogcodes species of Oriental region

The eight species hitherto recorded from this region are: *angustimarginatus* Brunetti, *fuscus* Brunetti, *lineatus* Brunetti, *marginifasciatus* Brunetti, *octomaculatus* Brunetti, *respersus* Séquy, *rufomarginatus* Brunetti and *sexmaculatus* Brunetti. All of these species except the Chinese *respersus* were described from either India or Ceylon. The name *octomaculatus* Brunetti is herein synonymized with *guttatus* Costa (see discussion under *guttatus*). To this list of

species can now be added two new ones, *orientalis* from Cambodia and *philippinensis*, making a total of 10 species known for this area.

Ogcodes (*Ogcodes*) *angustimarginatus* Brunetti

Oncodes angustimarginatus Brunetti, Fauna British India, vol. 1, p. 171, 1920.

Type locality: Ceylon.

Discussion: Species group unknown. According to a letter from Dr. B. P. Pal dated May 5, 1954, the type specimen of this species is in the National Pusa Collection at the Indian Agricultural Research Institute in New Delhi, India, and not in the British Museum as stated by Brunetti (1920, p. 171). A colored drawing of this type specimen was prepared for my study, and from this figure an entirely new species concept is deduced. This drawing shows the mesonotum to have a light brown ground color with three distinct black vittae, whereas Brunetti (1920, p. 171) stated: "*Thorax* moderately shining black, covered with moderately short, rather dense, brownish yellow pubescence; scutellum similar." Then at the end of his description he stated: "Described from a single specimen in the British Museum from Pirivipancheram, Ceylon, 21. i. 1892 (*Col. Yerbury*)." A note added: "Only example seen; at top of hill, found near form of a sambur. A second specimen from Pusa, 6. xii. 1911, with the thorax all black." This last statement infers that the type specimen had a differently colored thorax, and I interpret the thorax as being vittate as shown by the drawing of the type specimen. In this connection, I have assumed that somehow the type specimens of *angustimarginatus* and *octomaculatus* were mixed up, and that the figure of the thorax of *octomaculatus* by Brunetti (1920, pl. 2, fig. 28) is in reality that of *angustimarginatus* (see also the discussion under *guttatus*).

According to the drawing of the type on hand, veins M_1, r-m and m-cu are absent and the general body color is brown instead of black, but the narrow abdominal fasciae are about as described by Brunetti.

Ogcodes (*Ogcodes*) *respersus* Sèguy

Oncodes respersus Sèguy, Mus. Heude, vol. 2, p. 175, 1935.

Type locality: Tchen-kiang, Kiangsu Province, China (♀).

Discussion: This species probably belongs in group v, judging from the description and the resemblance to both *orientalis*, new species, and *philippinensis*, new species. Sèguy did mention, however, that the terminal antennal segment had two minute setae on the apex, and this is a character not common to the group. He did not mention the wing venation and the type female was not available for study.

Ogcodes (*Ogcodes*) *orientalis*, new species

PLATE FIGURES 20, 38, 112

Species of group v.

MALE: Length of entire specimen 4.60 mm., wing length 3.88 mm. Head with eyes, antenna, and oral region light brown, occiput and frons dark brown; antenna with long slender style, about as long as distitarsus, frons hardly swollen, oral area nearly V-shaped behind.

Thorax covered with golden pile and dark brown except for light brown to white narrow lateral margin of mesonotum, upper one-half of postalar callus, a pair of prescutellar (mesonotal) spots, upper one-half of metanotum, and large pleural area below wing base; legs slender, yellow except for dark brown coxae, trochanters, knees, and tarsal apices; hind femur longer than hind tibia, swollen distally to nearly twice the width at apex of trochanter; wing slightly browned, vein M_1 present, longer than R_{4+5}, crossvein r-m nearly vertical, crossvein m-cu a very faint crease, vein M_2 short, curved and strong, veins Cu_2 and anal well separated near hind margin (pl. 4, fig. 20), squama semitransparent, light brown, narrow margin and basal area dark brown; halter with dark brown knob, stem light brown.

Abdomen with rather narrow posterior white fasciae on tergites, dark brown except for large whitish brown mesolateral spots on tergites II and III; tergites II and III raised in middle to form slight swellings; abdominal pile short, golden brown, more dense and browner on swellings and sparse on tergites IV–VI; venter mostly white, sternites I and narrow lateral and anterior margins of II–VI dark brown; entire venter slightly pilose.

Genitalia dark brown, large, median plate about twice as long as wide in lateral view, about 1.6 times "wingspread"; "wings" short, pointed, basal cell incomplete, about twice as wide as high (pl. 13, fig. 112); aedeagus with apex rounded and somewhat narrowed (pl. 7, fig. 38).

FEMALE: Unknown.

HOLOTYPE: Male, Angkor, Cambodia, Feb. 21, 1928 (W. P. Cockerell, USNM 64440).

REMARKS: This species represents the first record of the genus from Indonesia. Its closest relatives appear to be *respersus* and *philippinensis*, but it differs from both in having tergites II and III swollen in the middle and is distinguished from the latter by the male genitalia (compare pl. 7, figs. 37 and 38, pl. 13, figs. 99 and 112). It also differs from *respersus* in having the hind femur swollen instead of the hind tibia.

Ogcodes (*Ogcodes*) *philippinensis*, new species

Plate figures 37, 99

Species of group v. This species is closely related to *orientalis*, new species, from which it differs as follows:

Male: Length of entire specimen 6.30 mm., wing length 5.25 mm.

Head black, only eyes dark brown; antenna somewhat shorter, oral area more U-shaped behind.

Thorax with mesonotal margin dark brown, entire mesonotum nearly black, postalar callus dark brown; venation as in plate 4, figure 20, except M_4 more gently curved at junction of m-cu crossvein; squama a darker brown.

Abdomen with dorsal spots yellow, larger, and with distinct dark brown spiracular spots on tergites II–IV, tergites II and III without medial swellings, dorsal pile all about equal length; venter yellow instead of white.

Genitalia with wing of equal width throughout, somewhat broadened at apex, median plate only about 1.15 times wingspread, its basal cell more triangular (pl. 13, fig. 99); aedeagus somewhat more swollen apically (pl. 7, fig. 37).

Female: Unknown.

Holotype: Male, Sibuyan Island, Philippine Islands (C. F. Baker, USNM 64441).

Remarks: This is apparently the first recorded species of *Ogcodes* from the Philippine Islands. Its closest relative is *orientalis*, as discussed above. Both show a relationship to *basalis* (Walker) from Australia, which suggests a Malaya-Australia-Philippines distribution.

Ogcodes species of Palaearctic subregion

Since Pleske (1930) and Sack (1936) have reviewed the Palaearctic species, only pertinent notes and synonymy of those species seen will be given here. The key presented by Sack (1936, p. 16) is quite usable. The 13 species included in his review are as follows: *etruscus* Griffini, *formosus* Loew, *fumatus* Erichson, *gibbosus* (Linnaeus), *guttatus* Costa, *hirtus* Sack, *jacutensis* Pleske, *nigripes* (Zetterstedt), *nigritarsis* Shiraki, *pallipes* Latreille, *trifasciatus* Shiraki, *varius* Latreille, and *zonatus* Erichson. Species not included in this work are *limbatus* Bigot and *varius* var. *siberiensis* Brunetti, as well as three subsequently described species, *nigritarsis* var. *obusensis* Ôuchi, *esakii* Ôuchi (1942), and *reginae* Trojan (1956). This makes a total of 18 species now known for this region.

O. trifasciatus Shiraki (1932) is preoccupied by *trifasciatus* Meijere (1915), and I propose *shirakii*, new name, for *trifasciatus* Shiraki at this time. (See also data in list of species, p. 316.)

Ogcodes (Ogcodes) zonatus Erichson

Plate figure 71

Ogcodes zonatus Erichson, Entomographien, vol. 1, p. 170, 1840.
Okcodes zonatus, Schiner, Verh. Zool.-Bot. Ges. Wien, vol. 15, p. 989, 1865.
Oncodes zonatus, Kertesz, Cat. Dipt., vol. 4, p. 20, 1909.—Wandolleck, Einleit, Inflatae, figs. on pls. 2 and 4, 1914.—Brunetti, Ann. Mag. Nat. Hist., vol. 18, p. 594, 1926.—Sèguy, Fauna France, vol. 13, p. 168, 1926.—Pleske, Konowia, vol. 9, p. 166, 1930.—Sack, Die Fliegen, vol. 98, p. 23, 1936.

Type locality: Germany.

Discussion: Species of group II. According to Pleske (1930) this species is widespread, reaching from Mongolia to Europe and south into North Africa, though it is as yet unknown from Scandinavia. This may be a Holarctic species as it seems very possible that *eugonatus* Loew is a synonym (see discussion under the latter). The possibility that *nigripes* (Zetterstedt) is merely the melanic form of *zonatus* is also discussed under *eugonatus*, and to briefly summarize, it appears to me that *melampus* Loew, *eugonatus* Loew, and *nigripes* (Zetterstedt) are all possibly color forms of *zonatus* Erichson. *O. zonatus* is also more closely related to *caffer* Loew than to any western Palaearctic species known to me.

Specimens examined: 5 ♂, 2 ♀.

Germany: 1 ♂, Nurnberg (Lichtwardt, EIS).
Switzerland: 2 ♂, 2 ♀, St. Mortiz, July 27, 1902 (Oldenberg, EIS) [det. by P. Sack].
Hungary: 2 ♂, without other data (EIS).

Ogcodes (Ogcodes) nigripes (Zetterstedt)

Henops nigripes Zetterstedt, Ins. Lapponica, p. 574, 1838.
Oncodes nigripes, Kertesz, Cat. Dipt., vol. 4, p. 19, 1909.—Verrall, Brit. Flies, vol. 5, p. 463, 1909.—Pleske, Konowia, vol. 9, p. 166, 1930.—Sack, Die Fliegen, vol. 98, p. 20, 1936.

Type locality: Lapponia Umensi (Sweden).

Discussion: Species of group II. This species has been recorded only from Scandinavia, but, on the basis of specimens before me, this form occurs also in the Swiss Alps. These specimens are from St. Moritz, Switzerland, July 27, 1902 (Oldenberg, EIS, DEI), and were mixed with other specimens from the same locality determined by Sack as *zonatus* Erichson. In comparing these with specimens of the Nearctic *melampus* Loew, no morphological differences were found, and *melampus* specimens fit the descriptions of *nigripes* given by Sack (1936, pp. 16, 20) and Zetterstedt (1838). For a further discussion of these species' relationships, see the notes under *eugonatus* Loew.

Ogcodes (Ogcodes) pallipes Latreille

Plate figures 51, 76, 86

Ogcodes pallipes Latreille, Encyclop. Method., vol. 7, p. 471, 1811.
Henops marginatus Meigen, Syst. Beschr., vol. 3, p. 100, pl. 24, fig. 30, 1822 (not Cole, 1919).
Oncodes pallipes, Kertesz, Cat. Dipt., vol. 4, p. 19, 1909.—Verrall, Brit. Flies, vol. 5, p. 466, 1909.—Brunetti, Ann. Mag. Nat. Hist., vol. 18, p. 594, 1926.—Sèguy, Fauna France, vol. 13, p. 167, 1926.—Pleske, Konowia, vol. 9, p. 166, 1930.—Sack, Die Fliegen, vol. 98, p. 21, 1936.

Type locality: Europe.

Discussion: This species is apparently a member of group iii. It seems to be restricted to Europe and western Asia and is not yet recorded from North Africa. The Nearctic species *borealis* Cole is apparently its nearest relative, and these two species are the only known representatives of group iii. The females of *pallipes* superficially resemble both *zonatus* Erichson and *gibbosus* (Linnaeus), but *pallipes* is the only one of the three with crossvein m-cu present. The male genitalia show similarity to those of *borealis* but at the same time are quite distinct (see pl. 8, fig. 51; pl. 11, fig. 76; pl. 12, fig. 86).

Specimens examined: 5♂, 10♀.

France: 1♂, 5♀, Ruiel S. et Oise, July 7, 1952 (H. L. Parker, USNM, EIS); 4♂, 3♀, Escragnoles Alpes, Eur. Par. Lab., #5498-3, ex. *Crabro* nest (USNM, EIS).

Germany: 1♀, Dessau (Oldenberg, EIS).

Hungary: 1♀, without other data (FRC).

Ogcodes (Ogcodes) guttatus Costa

Plate figures 6, 22, 66, 81, 91

Ogcodes guttatus Costa, An. Sci. Napoli, vol. 1, p. 80, 1854.
Oncodes benacensis Pokorny, Verh. Zool.-Bot. Ges. Wien, vol. 37, p. 389, p. 7, fig. 3, 1887.
Oncodes octomaculatus Brunetti, Rec. Indian Mus., vol. 7, p. 476, 1912; Fauna British India, vol. 1, p. 170, fig. 13, and pl. 2, figs. 28 (abdomen only), 29, 1920; Ann. Mag. Nat. Hist., vol. 18, p. 591, 1926. New synonymy.
Oncodes guttatus, Pleske, Konowia, vol. 9, p. 164, 1930.—Sack, Die Fliegen, vol. 98, p. 19, 1936.

Type locality: Italy: *guttatus*, *benacensis*. India: *octomaculatus*.

Discussion: Species of group ii. This rather uniquely patterned species has been recorded only from southern Europe. It is now known to occur in the Ethiopian and Oriental regions as well but is apparently only rarely encountered. Its distribution from Italy through Greece to Turkey and Persia to southeast India is fairly continuous, but the South African record cited below indicates a much wider range.

O. guttatus is related to and perhaps synonymous with *distinctus* Brunetti and *nyasae* Brunetti. Its wing venation (pl. 3, fig. 6) suggests placement in the *colei* group, but the male genitalia gives much evidence in support of my placing it in the *eugonatus* group (see pl. 10, fig. 66; pl. 11, fig. 81; pl. 12, fig. 91). It would also be plausible to set *guttatus* apart as a separate group intermediate between the *eugonatus* and *colei* groups.

Brunetti (1912) described *octomaculatus* from two male specimens from Igatpuri, Western Ghats, Bombay Presidency, India, Nov. 20, 1909 (Annandale), and stated that the types were in the Indian Museum, but he gave no figures at that time. In 1920 he redescribed the species and named a new species from India which he called *angustimarginatus*, but in this paper he figured only *octomaculatus*. Through the courtesy of Dr. B. P. Pal of the Indian Museum, beautiful colored drawings of the types of these two species were made available to me. It is now apparent that Brunetti's (1920, vol. 1, p. 170, pl. 2, fig. 28) figure of *octomaculatus* is a composite, in which the thorax represents *angustimarginatus* and the abdomen and wing represent *octomaculatus*. How this occurred I do not know, unless the specimen he drew (or rather had drawn for him) was actually parts of two specimens of the two species which had been glued together. At any rate, *octomaculatus* appears to be conspecific with *guttatus*. The male specimen cited below from South Africa was compared with males of *guttatus* from Turkey and Greece and is surely conspecific.

New distribution records:

Greece: 1♂, Mt. Pelion, July (G. Pandazis, USNM).

South Africa: 1♂, Mitchell's Pass, 100 miles from Cape Town, Dec. 1–5, 1930 (H. W. Simmonds, BMNH).

Turkey: 1♂, Constantinople, June 29 to July 4, 1925 (Miss G. Edwards, BMNH).

Ogcodes (Ogcodes) hirtus Sack

Plate figures 12, 26, 31, 54

Oncodes hirtus Sack, Die Fliegen, vol. 98, p. 20, pl. 2, fig. 8, 1936.

Type locality: Kurdistan, Iran (1♀, Dahlemer Museum).

Diagnosis: Species of group IV.

Male: Length of entire specimen 3.30 mm., wing length 3.00 mm. Head with reddish brown eyes, black occiput, dark brown protruding frons, light brown antennal-oral region; antenna light brown except dark brown style which is rather short, somewhat swollen along basal one-half, with 2–3 minute setae on apex; yellow pubescence on occiput short, long on oral region.

Thorax entirely shining black covered with long whitish brown pile, about twice as long as tarsal claw; metanotum quite prominent;

legs yellow except for black coxae, dark brown femora, and light brown tarsal apices; claws nearly black; wing hyaline, veins white, indistinct, but venation strong (pl. 3, fig. 12); vein M_1 absent except distal portion, r-m crossvein present, straight, nearly reaching M_4, m-cu crossvein strong, M_2 long, reaching wing margin; squama transparent, margin concolorous, halter knob black, stem white.

Abdomen long, narrow, distinctly arched with large dorsomedian, bituberculate swellings on tergites II–IV (pl. 5, fig. 26); tergites I–II mostly brownish black, with faintly indicated posterior white fasciae; tergites III–V with irregular brown and white pattern, rather similar to that shown by Sack (1936, fig. 8), the tubercles mostly brown as is anterior margin of each tergite, creamy white markings dominate laterally and behind; dorsum along midline including tubercles covered with long white silky pile, each hair somewhat browned at base, large lateral area with short, whitish yellow pubescence; sternites mostly dark brown with narrow posterior white fasciae, II–III with large white lateral spots, entire sternum covered with short white pile except for bare I.

Genitalia (pl. 6, fig. 31) minute, light brown, cercus nearly white in spots; aedeagus long, thin, with definite apical notch (pl. 9, fig. 54); ejaculatory apodeme small, narrow, with "wings" indistinct, "wingspread" about equal to greatest width of aedeagus.

Discussion: Apparently this species is still known only from the unique female type. For this reason the above description of the male seems necessary, though it is possible that the male described above is actually another closely related species. Such distinctive features as the tuberculate abdomen, and possibly different wing venation were not found in the female, but the former feature is true in many species of the genus, while the latter character is usually vague in descriptions.

The male genitalia and tuberculate abdomen of *hirtus* suggests a relationship to *guttatus;* however, the long body pile, two or more antennal setae, and male genitalic structures show it belongs in the *colei* group. Judging from its original description *hirtus* may be related to *formosus* Loew.

Specimen examined:

Iran: 1 ♂, Sharaf Khaneh, Sept. 5, 1949 (Richard P. Dow, USNM).

Ogcodes (*Ogcodes*) *varius* Latreille

Plate figures 47, 109

Ogcodes varius Latreille, Encyclop. Method., vol. 8, p. 471, 1811.
Henops limbatus Meigen, Syst. Beschreib., vol. 3, p. 100, 1822.
Henops apicalis Meigen, Syst. Beschreib., vol. 3, p. 101, 1822.
Ogcodes fuliginosus Erichson, Entomographien, vol. 1, p. 172, 1840.

Oncodes varius, Kertesz, Cat. Dipt., vol. 4, p. 20, 1909.—Verrall, Brit. Flies, vol. 5, p. 462, 1909.—Brunetti, Ann. Mag. Nat. Hist., vol. 18, p. 602, 1926.—Séguy, Fauna France, vol. 13, p. 168, 1926.—Pleske, Konowia, vol. 9, p. 165, 1930.—Sack, Die Fliegen, vol. 98, p. 22, 1936.

Type locality: Europe.

Discussion: Species of group v. This European species may extend east to Siberia as variety *siberiensis* Brunetti (1926, p. 603), and south to British East Africa and the Belgian Congo as variety *pallidimarginalis* Brunetti (1926, p. 602). However, it is also quite possible that both of these varieties are distinct species which are not closely related to *varius*.

The extremely restricted Nearctic species *rufoabdominalis* Cole is rather closely related to *varius* and suggests a Holarctic connection. However, they are easily separated by color characters and the male genitalia (see discussion under *rufoabdominalis*), In male genitalia, as well as color pattern, *varius* also shows definite similarities with the Australian *basalis* (compare pl. 13, figs. 101, 109).

The European species *cingulatus* Erichson appears to be conspecific with *varius*, but Sack (1936, p. 23) did not make the synonymy even though he examined the type of the former species.

Specimens examined: 4 ♂, 3 ♀.

Germany: 2♂, 1♀, Berlin, Jungfernheide, July 4, 28, 1901 (Oldenberg, EIS); 1♀, Schlesien (Letzner, EIS).

Hungary: 1♂, Budapest (Oldenberg, EIS); 1♂, without other data (FRC).

Corsica: 1♀, Vizzavona, July 13 to Sept. 5, 1931 (M. E. Mosely, BMNH).

Ogcodes (*Ogcodes*) *gibbosus* (Linnaeus)

Plate figures 13, 43, 111

Musca gibbosa Linnaeus, Syst. Nat., vol. 10, p. 593, 1758.

Henops leucomelas Meigen, Klassif., vol. 1, p. 151, pl. 8, fig. 30, 1804.

Oncodes gibbosus, Kertesz, Cat. Dipt., vol. 4, p. 18, 1909.—Verrall, Brit. Flies, vol. 5, p. 463, 1909.—Brunetti, Ann. Mag. Nat. Hist., vol. 18, p. 594, 1926.—Séguy, Fauna France, vol. 13, p. 167, 1926.—Pleske, Konowia, vol. 9, p. 166, 1930.—Sack, Die Fliegen, vol. 98, p. 18, 1936.

Ogcodes gibbosus, Sabrosky, Amer. Mid. Nat., vol. 39, p. 408, 1948.

Type locality: Europe.

Discussion: Species of group v. This widely distributed Palaearctic species apparently has no close Nearctic relative with the possible exception of *hennigi*, new species. Pleske (1930, p. 166) recorded it from the Siberian Orient, and while it appears to be rather common in northern and central Europe it has not been recorded from the Mediterranean region to my knowledge.

The aedeagus of *gibbosus* (pl. 8, fig. 43) is quite similar to that of the Nearctic *sabroskyi*, new species, and of *boharti*, new species; however, except in this feature *gibbosus* does not appear to be closely related.

SPECIMENS EXAMINED: 2 ♂, 9 ♀.

BELGIUM: 3 ♀, Sutendaal, June 17, 1919 (USNM).

GERMANY: 1 ♂, Potsdam, July 5, 1922 (Oldenberg, EIS); 1 ♂, Frankfurt, Gulde, June 24, 1908 (Offenbach, EIS); 1 ♀, Kolkhorst, July 25, 1888 (EIS); 1 ♀, Berlin, Grunervld., June 15, 1894 (Lichwardt, EIS); 1 ♀, Munchen, July 10, 1911 (EIS); 2 ♀, Uckeritz-Usedom, June–July, 1936 (R. Korschefsky, EIS).

RUSSIA: 1 ♀, Araxesthal, Kaukasus, May 13, 1892 (Reitt, VNM).

Ogcodes species of Nearctic subregion

Thirteen species of the genus *Ogcodes* have been described from this subregion that are now considered valid: *albiventris* Johnson, *borealis* Cole, *colei* Sabrosky, *dispar* (Macquart), *dusmeti* Arias, *eugonatus* Loew, *floridensis* Sabrosky, *melampus* Loew, *niger* Cole, *pallidipennis* Loew, *rufoabdominalis* Cole, *shewelli* Sabrosky and *vittisternum* Sabrosky. *O. albiventris* is hereby removed from the subgenus *Ogcodes* to form the type of the new subgenus *Neogcodes*, while the addition of five new species—*adaptatus*, *boharti*, *canadensis*, *hennigi* and *sabroskyi*—brings the total number of known species to 18. These species represent four of the six species groups known for the world, with only the *porteri* and *brunneus* groups being absent.

The distribution of *Ogcodes* in the central Nearctic area is shown in text figure 4. The unlined parts (Upper and Lower Sonoran Zones) show a paucity of records indicating that these species are obviously more Transitional and Boreal in their distributions. Typical species distributional patterns are given for several of the more common species (text figs. 5–9).

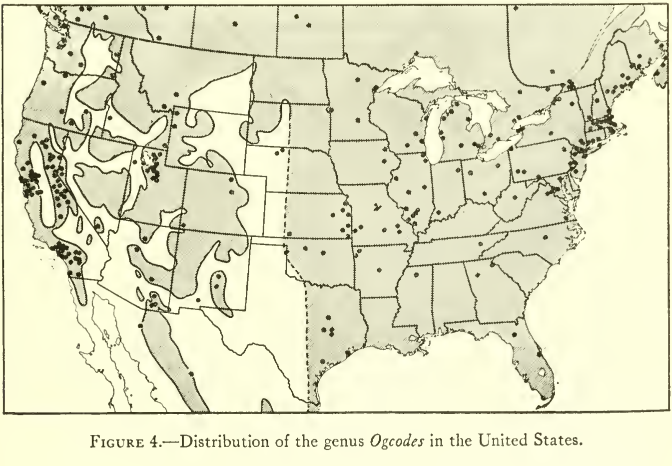

FIGURE 4.—Distribution of the genus *Ogcodes* in the United States.

Rather than attempt to make individual keys to the *Ogcodes* species of North and South America, it was felt that one key would be more practical, particularly since it now seems very possible that a few species may be found to occur in both areas. Parts of this key were adapted from Sabrosky (1948), and although the key was made primarily for males, females of most species will key out. Females of the following species are unknown: *chilensis* Sabrosky, *floridensis* Sabrosky, *porteri* Schlinger, *shewelli* Sabrosky, *triangularis* Sabrosky, and the new species *boharti*, *brasilensis*, *canadensis*, *colombiensis*, *hennigi*, and *sabroskyi*. Males are unknown for *niger* Cole.

Key to the American species of *Ogcodes* Latreille

1. Vein M_1 present and distinct throughout its length, usually attached basally to the stub or r-m crossvein (pl. 3, fig. 6) 2
   Vein M_1 absent, or present only as a crease, or possibly veinlike in the distal portion (pl. 3, figs. 9, 12; pl. 4, figs. 16–19) 18
2. Crossvein m-cu present and distinct, though sometimes faint in its approach to vein M_4 3
   Crossvein m-cu absent 8
3. Abdominal tergites dark brown to black with light brown to white posterior fasciae (about as in pl. 5, fig. 29); r-m crossvein present or absent . . . 4
   Abdominal tergites with white or yellow spots in addition to posterior fasciae; r-m crossvein absent 5
4. Body ground color black; antenna whitish; r-m crossvein absent; only female holotype known (Utah) . . . . **niger** Cole
   Body ground color brown; antenna brown; r-m crossvein present; aedeagus as in pl. 9, fig. 56 (Canada and northern United States) . **borealis** Cole
5. Abdominal venter with three rows of blackish brown spots composed of a large subquadrate median spot and a lateral spot on each sternite except 1, which is entirely black; abdominal pile scarce and quite browned; aedeagus as in pl. 10, fig. 63 (Oregon and Washington). . . . **vittisternum** Sabrosky
   Without the above combination of characters 6
6. Second tergite entirely yellow, the third and fourth tergites with three brown spots, the fifth and sixth almost entirely shining brown; abdominal venter mostly bright yellow including sternite 1; aedeagus about as in pl. 10, fig. 63 (Florida) . . . . **floridensis** Sabrosky
   Second to fourth tergites each with large median spot; venter mostly white. 7
7. Second to fourth tergites each with a median triangular black spot; femora and tibiae bright yellow; aedeagus as in pl. 10, fig. 62 (eastern Canada and New York) . . . . **shewelli** Sabrosky
   Second to fourth tergites each with a broad subquadrate black spot; femora infuscated basally; aedeagus as in pl. 10, fig. 64 (Arizona and California). **colei** Sabrosky
8. Mesonotal disc with stripes or patterned, or if not striped, then ground color dark orange, light brown or yellow 9
   Mesonotal disc not patterned, ground color black 11
9. Spiracular area usually as dark brown spots contrasting with lighter colored tergites; abdomen orange to light brown with white or brownish white

posterior fasciae on tergites; meosnotal disc with or without indications of one to three longitudinal stripes; aedeagus as in pl. 7, fig. 35 (United States south to Costa Rica) . . . . **dispar** (Macquart)

Spiracular area concolorous with tergites; abdomen dark or light brown, not orange (South American species) 10

10. Mesonotal disc dark brown with black median stripe and a black lateral stripe which widens and recurves forward near postalar callus; abdomen of nearly uniform blackish brown with distinct posterior white fasciae; tergite II distinctly raised so as to nearly conceal view of metanotum; aedeagus as in pl. 7, fig. 40 (Colombia) . . . **colombiensis,** new species

Mesonotal disc light brown with three dark brown longitudinal stripes, median one complete, lateral one reaching from postalar callus to little beyond wing base, straight; abdomen mostly light brown, darker brown near each tergal fascia and on anterior one-half of each sternite; tergite II not raised, metanotum clearly visible, abdomen long and slender; aedeagus as in pl. 8, fig. 50 (Brazil) . . . . **brasilensis,** new species

11. Dorsum of abdomen reddish orange with median row of broadly triangular black or brown spots; aedeagus as in pl. 7, fig. 34 (Utah).

rufoabdominalis Cole [also **dusmeti** Arias, from Mexico]

Dorsum of abdomen about as in pl. 5, fig. 29, with even fasciae 12

12. General habitus brown; humerus and postalar callus light to dark brown; scutellum rarely all black; aedeagus as in pl. 7, fig. 36 (Canada south to Costa Rica) . . . . **pallidipennis** Loew

General habitus black; humerus, postalar callus and scutellum black . . . 13

13. Abdominal tergites black with very narrow posterior white fasciae covering about one-fifth to one-sixth of each segment 14

Abdominal tergites black or dark brown with the wide posterior white fasciae covering about one-fourth to one-third of each segment 15

14. Thoracic pile short, golden yellow; sternites II–IV with posterior white fasciae expanded medially; squama evenly infuscated; ejaculatory apodeme as in pl. 13, fig. 107; aedeagus as in pl. 8, fig. 44 (Georgia).

sabroskyi, new species

Thoracic pile short, whitish yellow; sternites II–IV with posterior white fasciae of even width; squama opaque white except for dark brown circular spot covering basal one-third; ejaculatory apodeme as in pl. 13, fig. 105; aedeagus as in pl. 8, fig. 49 (Canada) . . . . . **canadensis,** new species

15. Legs mostly black 16

Legs mostly brown 17

16. Abdominal sternites I and much of II mostly black; abdominal tergites with posterior white fasciae covering about one-fourth of each segment; eyes black; r-m crossvein distinct; ejaculatory apodeme as in pl. 6, fig. 32; aedeagus as in pl. 7, fig. 41 (western North America).

adaptatus, new species

Abdominal sternites I and one-half of II mostly white; abdominal tergites with posterior white fasciae covering about one-third of each segment; eyes brown; r-m crossvein indistinct; ejaculatory apodeme as in pl. 13, fig. 100; aedeagus as in pl. 8, fig. 45 (New York) . . **hennigi,** new species

17. Abdominal tergites with posterior white fasciae enlarged medially; legs mostly dark brown, tibiae light brown, apices of tarsi black; r-m crossvein absent; ejaculatory apodeme as in pl. 13, fig. 103; aedeagus as in pl. 7, fig. 39 (Argentina) . . . . **argentinensis,** new species

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Abdominal tergites with rather even posterior white fasciae; legs dark brown, only apical three-fourths of femora and knees light brown; r-m crossvein present; ejaculatory apodeme as in pl. 13, fig. 104; aedeagus as in pl. 7, fig. 42 (Arizona) . . . . **boharti,** new species

18. Species with common *Ogcodes* pattern (pl. 5, fig. 29). 19
 Species with abdomen patterned in various ways, but not only with simple fasciae (pl. 5, fig. 30) 23
19. Crossvein m-cu present; abdomen almost entirely black; only female holotype known (Utah) . . . . **niger** Cole
 Crossvein m-cu absent 20
20. Thorax black to reddish black; humerus and postalar callus yellow to orange (Chile) . . . . **chilensis** Sabrosky
 Thorax black; humerus and postalar callus usually black or dark brown . 21
21. Legs pale brownish yellow except for black coxae; aedeagus as in pl. 9, fig. 56 (Canada and northern United States) . . . . **borealis** Cole
 Legs usually dark brown or black, if lighter colored, then at least basal two-thirds of femora infuscated 22
22. Legs black, except knees narrowly orange or brown; abdominal tergal posterior white fasciae usually narrow, covering about one-third of each segment; aedeagus about as in pl. 11, fig. 73 (northwestern America; United States to Alaska) . . . . **melampus** Loew
 Legs brown to deep yellow, usually basal two-thirds of femora, basal one-fourth of tibiae, and all tarsi somewhat infuscated; abdominal tergal posterior white fasciae narrow (in most females) to wide (in most males), sometimes as wide as two-thirds length of each segment; aedeagus as in pl. 11, fig. 73 (Canada to southern Mexico) . . . . . **eugonatus** Loew
23. Veins M_2 and M_4 absent (Chile) . . . . **porteri** Schlinger
 Veins M_2 and M_4 present 24
24. Crossvein m-cu absent; abdomen mostly white with scattered brown spots (pl. 5, fig. 30) (California, British Columbia, Michigan, and Ontario).
 albiventris (Johnson)
 Crossvein m-cu present (Chilean species) 25
25. Vein M_1 (although absent in the strict sense) appears to be present as a strong crease and veinlike apically; abdominal pile predominantly black; tergites III–V black on posterior halves; aedeagus as in pl. 9, fig. 59 (Juan Fernandez Islands, Chile) . . . . **kuscheli** Sabrosky
 Vein M_1 entirely absent; abdominal pile whitish yellow; tergites III–IV with large brown triangular spots, the yellow lateral areas to these triangles intersecting them and the lateral brown spots at the posterior margins (Chile) . . . . **triangularis** Sabrosky

Subgenus *Ogcodes* Latreille

Ogcodes (*Ogcodes*) *eugonatus* Loew

PLATE FIGURES 18, 73, 78, 94

Oncodes eugonatus Loew, Berliner Ent. Zeit., vol. 16, p. 60, 1872.
Ogcodes eugonatus, Cole, Trans. Amer. Ent. Soc., vol. 45, p. 62, 1919.—Sabrosky, Amer. Mid. Nat., vol. 31, p. 394, 1944; Amer. Mid. Nat., vol. 39, p. 426, pl. 2, figs. 12, 15, and 21, 1948.
Ogcodes pallidipennis, Cole, in part, Trans. Amer. Ent. Soc., vol. 45, p. 64, 1919 (not Loew, 1872).

Ogcodes marginatus Cole, Trans. Amer. Ent. Soc., vol. 45, p. 67, pl. 15, fig. 42, 1919 (not Meigen, 1822).

Ogcodes albicinctus Cole, Psyche, vol. 30, p. 47, 1923 (new name for *marginatus* Cole, not Meigen).—James, Journ. Kansas Ent. Soc., vol. 11, p. 29, 1938.—Sabrosky, Amer. Mid. Nat., vol. 31, p. 392, 1944; Amer. Mid. Nat., vol. 39, p. 425, pl. 2, fig. 21, 1948. New synonymy.

Ogcodes albicincta, Cole, Proc. California Acad. Sci., ser. 4, vol. 16, p. 422, figs. 81, 90, 1927 (lapsus).

DIAGNOSIS: Species of group II with typical *Ogcodes* pattern (pl. 5, fig. 29); vein M_1, although usually completely absent, is sometimes faintly present basally (pl. 4, fig. 18); thorax black, sometimes females with brown markings on humerus, scutellum, postalar callus, and pleurites; legs vary from dark to light brown with only coxae black, tibiae usually dark brown; male genitalia as shown in plate 11, figure 78, plate 12, figure 94 (ejaculatory apodeme), and plate 11, figure 73 (aedeagus).

TYPE LOCALITY: Texas (♂, Belfrage, MCZ).

DISTRIBUTION: This is a widespread species ranging from southern Mexico to Canada. It is apparently adapted primarily to the Sonoran and Transition Zones, and is more common at the lower elevations (see text fig. 5).

RECORDED DISTRIBUTION: About 200 specimens have been listed from the following areas: Alberta, Arkansas, California, Colorado, Illinois, Indiana, Kansas, Maine, Massachusetts, Michigan, Missouri, Mexico (Morelos), Montana, New Jersey, New York, Ohio, Oklahoma, Ontario, Texas, Utah, Virginia, Washington D.C., West Virginia, and Wyoming. All records west of the Rocky Mountains were given as *albicinctus* Cole.

NEW DISTRIBUTION RECORDS: (157 specimens, 86♂, 71♀.) Because of the large number of recorded specimens, only those new ones of special importance and new state records are cited here.

ARIZONA: 1♀, Coconino Co., Aug. 13, 1947 (R. H. Beamer, UK); 1♀, Phelps Bot. Area, White Mts. (A. and H. Dietrich, CU).

BRITISH COLUMBIA: 1♂, Smithers, July 17, 1949 (P. R. S., BC); 1♂, Lytton, June 20, 1931 (G. J. Spencer, BC); 1♀, Cultus Lake, July 6, 1948 (H. R. Foxlee, CNM).

CALIFORNIA: 11♂, Morongo Valley, San Bernardino Co., Apr. 19, 1951 (E. I. Schlinger, EIS), 3♂, same data (E. J. Taylor, EIS), 5♂, same data (R. C. Bechtel, EIS, DEI); 3♂, 2♀, same locality, June 18, 1951 (R. C. Bechtel, CIS, EIS, INHM); 1♀, Putah Canyon, Yolo Co., Aug. 20, 1952 (J. K. Traub, EIS); 7♂, La Mesa, San Diego Co., Jan. 23, 1953 (taken from *Crabro* nest, F. X. Williams, CAS, EIS).

CONNECTICUT: 1♀, Pine Orchard in Branford, July 26, 1904 (H. L. Viereck, CAES); 1♂, New Haven, July 13, 1904 (P. L. Butrick, CAES); 1♀, Indian Neck, Branford, July 22, 1932 (reared by B. J. Kaston, CAES) [det. by Curran and recorded by Kaston, 1937, as *O. pallidipennis* Loew].

Manitoba: 2♂, 2♀, Aweme, July 11, 1922 and July 3, 1923 (R. M. White, CNM); 3♀, Aweme, June 26, 1911 and July 20, 1911 (N. Criddle, PANS).

Mexico: 1♀, Baja California, Johnson Ranch, May 7, 1938 (W. E. Simmonds, EIS); 1♀, Chiapas, 6 miles southwest of Arriaga, sea level, Aug. 12, 1952 (C. D. MacNeill, CIS).

Montana: 1♀, Kalispell, June 13, 1920 (BMNH).

Nebraska: 1♂, 1♀, Cherry Co., Aug. 22, 1945, on fire tower (D. Gates, UN); 1♂, 30 miles south of Valentine, June 9, 1950 (Slater, Hicks, Laffoon, EIS).

Nevada: 1♀, Charleston Mts., Willow Creek Camp, July 1, 1954 (E. I. Schlinger, CIS).

New Mexico: 1♂, Ruidosa, June 26, 1940 (L. C. Kuitert, EIS); 1♀, Beien, Aug. 19, 1927 (L. D. Anderson, UK); 1♂, Corona, June 8, 1950 (L. D. Beamer, UK).

New York: 1♂, Orient, Long Island, July 4, 1907 (R. Latham, AMNH).

Quebec: 1♂, 1♀, Rupert House, July 10, 1949 (D. P. Gray, CNM).

Utah: 1♂, Soldier Summit, June 18, 1940 (Knowlton and Harmston, USAC).

Seasonal occurrence: From Apr. 12 (Texas) to Sept. 6 (Kansas); from Apr. 19 to Sept. 10 (California) and from Aug. 12 to Oct. 28 (southern Mexico).

Recorded hosts: *Pardosa distincta* (Blackwall) from Ontario by Sabrosky (1948, p. 427); *Pardosa banksi* Chamberlin from Connecticut by Kaston (1937, p. 419, given as host of *pallidipennis* Loew).

New host record: *Pardosa sternalis* Thorell (?), immature, collected at Quincy, Plumas County, Calif., May 6, 1950, by the author. The parasite (♀) emerged from host May 11, pupated May 13, emerged as an adult May 18, and died May 22, 1950.

Biology: Although it is a fact that the only known genus of hosts for *eugonatus* is *Pardosa* Koch, in all probability other lycosids will be found to serve as hosts as well.

Kaston (1937, p. 419) reared two specimens of *eugonatus*, gave one day as their emergence to prepupal period, and said their pupal period lasted 5–6 days. The only specimen reared by the author had similar periods of development, and the adult female lived only 4 days in captivity.

Sabrosky (1944, pp. 394–395) recorded finding a large series of adults in a neglected orchard near Beulah, Mich., in 1942–43. He said they were usually "found clinging to the underside of dead twigs on dead or dying young cherry trees . . . in no case were they taken on twigs bearing leaves." I have had only one occasion to observe this species in any numbers. This was in 1951 in tall grass bordering rather dry pasture land in Morongo Valley, Calif. (this pasture has since been burned over). Specimens were taken in open flight by net and also by sweeping the tall grass. Several specimens, all males, were collected some distance away on the trunks of large willow trees. All the specimens observed on this day (Apr. 19, 1951) were males. On June 18, 1951, R. C. Bechtel collected in this same pasture and obtained only females. This would indicate that the actual time that

both sexes occurred in this area was less than two months. Some of the females collected by Bechtel laid eggs in large gallon jars. These eggs were kept in the laboratory at 80 percent humidity and 85° F., but no larvae emerged. Apparently the one-day trip of some 24 hours without proper humidity-temperature control was enough to desiccate 100 percent of the eggs. The first-instar larva of this species is still unknown.

Specimens of this species were reported by Bechtel and Schlinger (1957) as larval provisions in the nests of a crabronid, *Ectemnius* (*Hypocrabro*) *spiniferus* Fox, near Sacramento, Calif.

Discussion: An examination of the male holotype (Wyoming) and the two male paratypes (Kansas) of *albicinctus* Cole, together with a large series of *eugonatus* (about 250 specimens) from throughout its range, indicated that *albicinctus* is merely a low-frequency color variant of *eugonatus*. Furthermore, Cole (1919) admittedly did not know *eugonatus* when he described *albicinctus* (as *marginatus* Cole). Further evidence to support this synonymy is given by the series of specimens from Morongo Valley, Calif., in which there were examples of both color forms. Also, when the male genitalia of typical *eugonatus*, typical *albicinctus*, and typical *melampus* Loew were examined in series, the slight differences noted by Sabrosky (1948) were found to occur in each of the so-called species with about the same frequency. *O. melampus* will probably be found to be a melanic color variant of *eugonatus* when more specimens can be studied (see discussion under *melampus*). The probable relationship of *eugonatus* to the Nearctic species is shown in text figure 3.

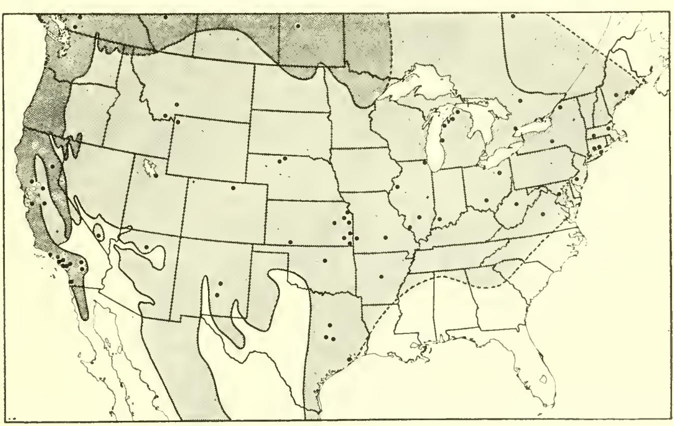

Figure 5.—Distribution of *Ogcodes eugonatus* Loew (solid circles) and *O. melampus* Loew (open circles) in the United States.

There can be little doubt that *eugonatus* is closely related to the European *zonatus* Erichson, and I am inclined to believe they are conspecific, though possibly representing geographical subspecies. Since *melampus* is related to *eugonatus* in the same way *zonatus* is to *nigripes* (Zetterstedt), and *melampus* is indistinguishable from *nigripes*, it could well be that all these "species" are subspecies or variations of *zonatus*.

Ogcodes (*Ogcodes*) *melampus* Loew

Oncodes melampus Loew, Berliner Ent. Zeit., vol. 16, p. 60, 1872.
Ogcodes melampus, Cole, in part, Trans. Amer. Ent. Soc., vol. 45, p. 61, 1919.—Cole and Lovett, Proc. California Acad. Sci., ser. 4, vol. 11, p. 239, 1921.—Sabrosky, Amer. Mid. Nat., vol. 39, p. 424, 1948.

DIAGNOSIS: Species of group II. Very similar to the preceding species except that the general habitus of *melampus* is black instead of brown and the legs are nearly all black.

TYPES: 2♂, 1♀, cotypes, California (H. Edwards, MCZ).

DISTRIBUTION: This species inhabits the Upper Sonoran and Transition Zones of California, and ranges north through Washington and British Columbia to Alaska. The Minnesota record is the only one east of the Pacific Coast, and indicates that the distribution is probably much wider than is now known (see text fig. 5).

RECORDED DISTRIBUTION: Alaska, California (Alviso, Santa Cruz Mts., Carrville), Nevada (Ormsby County), and Washington (Mt. Rainier), all recorded by Sabrosky (1948, p. 425).

NEW DISTRIBUTION RECORDS: (26 specimens, 15♂, 11♀.)

BRITISH COLUMBIA: 2♂, Midday Valley, Merritt, July 1924 (K. Ruden, BC, EIS); 1♀, Duncan, June (CNM) [homotype, compared by Curran].

CALIFORNIA: 1♂, Patterson, Stanislaus Co., Aug. 6, 1952 (W. W. Middlekauff, CIS); 2♂, San Jose, Santa Clara Co., May 20, 1947 (Wm. Hoyt, PHA); 1♂, Head of Virginia Canyon, Yosemite N.P., Aug. 4, 1939 (R. L. Usinger, CAS); 1♂, Pleasanton, Alameda Co., Aug. 31, 1932 (A. E. Michelbacher, CIS); 1♀, Base of Mt. Dana, Tuolumne Co., July 17, 1949 (L. L. Jensen, CIS); 2♂, Rio Vista, Solano Co., June 2, 1949 (R. S. Beal, EIS); 1♂, Davis, Yolo Co., May 13, 1946 (A. T. McClay, UCD); 1♀, same data, May 22, 1948 (B. Stevens, EIS); 1♀, same data, May 9, 1949 (reared, E. I. Schlinger, EIS); 1♂, Vacaville, Solano Co., Apr. 19, 1946 (A. T. McClay, UCD); 1♂, 5♀, Mountain View, Santa Clara Co., Sept. 12, 1930 (SU, EIS); 1♀, Fish Canyon, San Gabriel Mts., Los Angeles Co., June 1942 (reared, E. I. Schlinger, EIS); 1♀, Sunol, Alameda Co., May 24, 1931 (GEB); 1♂, Temecula, Riverside Co., Apr. 27, 1950 (S. F. Bailey, EIS).

MINNESOTA: 1♂, Shore of Lake Superior at Split Rock, St. Louis Co., July 1, 1935 (D. G. Denning, UM).

NEVADA: 1♂, N.W. side of Washoe Lake, Washoe Co., June 16, 1952 (E. I. Schlinger, EIS).

SEASONAL OCCURRENCE: From Apr. 19 to Nov. 12 (California), and July (Alaska).

RECORDED HOSTS: None.

New host records: (1) *Tarentula kochi* Keyserling, immature, collected at Fish Canyon, San Gabriel Mts., Calif., by the author. The parasite (♀) emerged and became an adult in June 1942. (2) *Xysticus cunctator* Thorell, immature, collected at Davis, Yolo Co., Calif., by the author. The parasite (♀) emerged from the host May 9, 1949, pupated May 11, emerged as an adult May 16, and died May 23, 1949.

Biology: Nothing has been recorded in the literature, and the only known hosts are given above.

Discussion: As mentioned above *melampus* is quite closely related to *eugonatus* and may be only its melanic form. However, since specimens of *melampus* are rare, occur in only a small part of the range of *eugonatus*, and apparently are not limited simply by climatic conditions, it does not appear possible at this time to establish the fact that synonymy may be involved. Although the two species appear to be sympatric, at least where *melampus* occurs, in no case have the two species been taken together (that is, under identical ecological conditions). In fact, *melampus* has only on few occasions been taken in association with any other *Ogcodes* species and that species, *adaptatus*, is a member of the distinctly different *pallidipennis* group.

At present *melampus* is differentiated from *eugonatus* only by its darker coloration, and is apparently indistinguishable from the northern European species, *nigripes*. For further notes see discussions under *eugonatus*, *nigripes*, and *zonatus*.

Ogcodes (*Ogcodes*) *borealis* Cole

Plate figures 7, 56, 72, 85

Ogcodes borealis Cole, Trans. Amer. Ent. Soc., vol. 45, p. 68, 1919; Psyche, vol. 30, p. 48, 1923; Proc. Ent. Soc. Washington, vol. 26, p. 182, 1924.—Sabrosky, Amer. Mid. Nat., vol. 31, p. 393, 1944; Amer. Mid. Nat., vol. 39, p. 413, pl. 2, figs. 10, 13, 16, 1948.

Western subspecies (?) of *Ogcodes pallidipennis* Loew, Sabrosky (in part only, not figures), Amer. Mid. Nat., vol. 39, p. 418, 1948.

Ogcodes colei Sabrosky (Grass Valley, Calif., specimen only, not figures), Amer. Mid. Nat., vol. 39, p. 423, 1948.

Diagnosis: Species of group III with typical *Ogcodes* pattern (pl. 5, fig. 29), but tergal posterior white fasciae are quite narrow; characterized by having vein M_1 and crossveins r-m and m-cu distinctly present (pl. 3, fig. 7), coxae black (males) or partially yellow (females), otherwise legs yellow to brownish yellow; mesonotum and scutellum black, abdomen dark brown to black, the dark sternal fasciae broad and of even width; antennal style with one to four small apical setae; male genitalia with median plate of ejaculatory apodeme greatly expanded basally, forming two distinct cells (pl. 11, fig. 72, and pl. 12,

fig. 85); aedeagus with a subapical, fingerlike process (pl. 9, fig. 56).

TYPES: Holotype ♀, Montreal, Quebec, Canada, May 28, 1902, and paratype ♀, St. Johns County, Quebec (both in MCZ).

DISTRIBUTION: This species appears to be somewhat confined to the Canadian and Transition Zones of northern United States and southern Canada, and although ranging widely is not at all common (see text fig. 6).

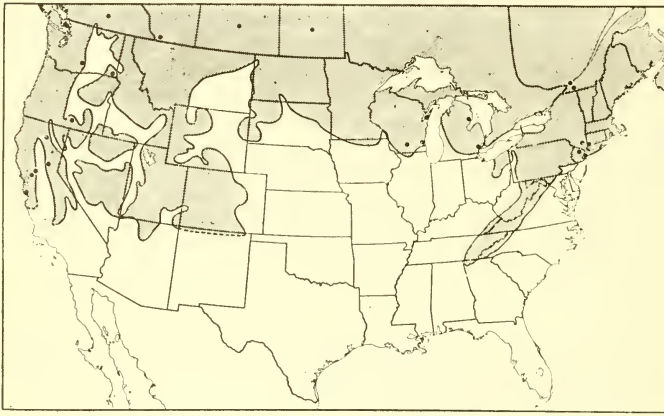

FIGURE 6.—Distribution of *Ogcodes borealis* Cole in the United States.

RECORDED DISTRIBUTION: Alberta (Waterton), Manitoba (Berens River), Maryland (Plummers Island), New York (McLean), and Saskatchewan (Waskesia), all Sabrosky (1948).

NEW DISTRIBUTION RECORDS: (27 specimens, 13 ♂, 14♀.)

ALBERTA: 1♀, Waterton Park, July 13, 1923 (E. H. Strickland, FRC).

BRITISH COLUMBIA: 1♀, Lorna, July 9, 1924 (G. Hopping, CNM), 1♀, London Hill Mine, Bear Lake, 7,000 ft., collected on snow (A. N. Caudell, USNM).

CALIFORNIA: 1♀, Putah Canyon, Yolo Co., April 21, 1949 (E. I. Schlinger, EIS); 1♀, same data, March 1934 (G. E. Bohart, GEB) [recorded by Sabrosky, 1948, as western subspecies of *O. pallidipennis* Loew]; 1♀, 12 mi. S. Grass Valley, Nevada Co., May 18, 1930 (E. P. VanDuzee, CAS) [recorded by Sabrosky, 1948, as possibly *colei* Sabrosky]; 1♀ (atypical), Hat Lake, Shasta Co., July 1948 (A. S. Perry, CIS); 1♂, 2♀, Santa Cruz Mts., Santa Cruz Co. (USNM) [det. as *melampus* by Coquillet, recorded as *melampus* by Cole, 1919, and as western subspecies of *pallidipennis* by Sabrosky, 1948, in part].

CONNECTICUT: 1♂, Redding, July 8, 1932 (A. L. Melander, ALM).

MANITOBA: 1♂, Machimac (?), July 3, 1910 (M. C. VanDuzee, CAS).

MAINE: 1♂, E. Harpswell, July 6, 1942, beaten from spruce or fir (AMNH).

MICHIGAN: 1♂, 1♀, Detroit, June 25 to July 1, 1944 (G. Steyskal, GS).

New York: 1 ♂, Cold Spring Harbor, June 25, 1930 (C. H. Curran, AMNH); 1 ♂, Bethpage, Long Island, Aug. 1938 (F. S. Blanton, CU).

New Jersey: 1 ♀, Ramsey, July 26, 1944 (W. J. Gertsch, AMNH), reared from *A. saltabunda* [recorded by Sabrosky, 1948, as *O. pallidipennis*].

Ontario: 1 ♂, Pancake Bay, Lake Superior, July 30, 1948 (W. J. Gertsch, AMNH).

Oregon: 1 ♂, Drews Gap, Klamath Co., July 6, 1950 (H. E. Cott, EIS).

Quebec: 1 ♂, Montreal Island, June 12, 1904 (ALM).

Washington: 1 ♂, Asotin, April 22, 1923 (A. L. Melander, ALM); 1 ♂, Zillah, June 23, 1923 (A. L. Melander, ALM); 1 ♀, Waldron Island, July 1, 1909 (W. Mann, USNM) [recorded by Sabrosky, 1948, as western subspecies of *pallidipennis*].

Wisconsin: 1 ♂, Dane Co., July 17, 1947 (D. C. Drake, EIS); 1 ♀, Door Co., July 7, 1950 (C. L. Fluke, UW); 1 ♀, Milwaukee Co., Aug. 11, 1902 (GEB).

Seasonal occurrence: From March (California) to Aug. 23 (Maryland), but more often encountered from May to July.

Recorded hosts: *Anyphaenella saltabunda* Hentz (recorded by Sabrosky, 1948, as host of *O. pallidipennis* Loew).

New host record: *Xysticus montanensis* Keyserling, immature, collected at Putah Canyon, Calif., Apr. 12, 1949. The parasite (♀) emerged from host Apr. 14, pupated Apr. 17, emerged as adult Apr. 21, and died Apr. 27, 1949.

Biology: Unknown except for rearing records cited above.

Discussion: Sabrosky (1944, 1948) first defined the male of the species and established its limits. On the basis of its wing venation and male genitalia, *borealis* forms a distinct segment of the subgenus shared only by the European species *pallipes*. But *borealis* is easily separable from the latter by its darker coloration and by the distinct fingerlike appendage of the aedeagus (compare pl. 8, fig. 51 and pl. 9, fig. 56).

Some confusion still exists as to the exact identity of this species since the type specimen was a female. Both Sabrosky (1948) and the author have a species concept which includes, among other features, the following wing venational characteristics: Vein M_1 strong, attached basally to stub of r-m crossvein; m-cu crossvein present and distinct; vein M_2 long; anal vein and vein Cu_2 join before wing margin (see pl. 3, fig. 7). However, according to a letter from P. J. Darlington, Jr. (1952), who compared an inked wing drawing (prepared by the author) with the female type of *borealis*, the following points were noted: Vein M_1 present, but faint; crossveins r-m and m-cu absent and vein M_2 short. This suggests a wing venation similar to that shown for *eugonatus* (pl. 4, fig. 18) except that vein M_1 is more complete in the type specimen. Two specimens (1 ♂, 1♀) out of some 35 examined appeared to be *borealis*, but each had a very weak vein M_1 and crossvein m–cu; hence, this species was keyed out twice in the key presented above.

For the present I conclude that the type female of *borealis* represents an atypical member of the population. However, there is the possibility that *borealis* of Cole is not the same as that of Sabrosky (1948) and this author, and a new species may be involved here.

Ogcodes (*Ogcodes*) *colei* Sabrosky

Plate figures 21, 64, 98

Ogcodes colei Sabrosky, Amer. Mid. Nat., vol. 39, p. 423, pl. 1, fig. 7, pl. 2, fig. 18, 1948.

Diagnosis: Species of group iv. Male abdomen patterned, without obvious tergal white fasciae; similar to both *vittisternum* Sabrosky and *shewelli* Sabrosky, but with abdomen mostly brown and not yellow; both tergites ii, iii have a large brown median spot which is flanked by yellow areas, tergites iii, iv are nearly entirely brown; abdominal pile about twice as long as that on mesonotum; venter with lateral but no median row of brown spots; venation as in plate 4, figure 21; male genitalia with distal portion of aedeagus markedly acuminate (pl. 10, fig. 64) and with weakly developed ejaculatory apodeme (pl. 12, fig. 98).

Types: Holotype ♂, Huachuca Mts., Ariz. (USNM 58366). Paratype ♂, Tallac Lake, Tahoe, Calif., July 5, 1915 (E.P. VanDuzee, FRC). The locality spelling is probably "Tallac" and not "Tallao" as originally published.

New distribution record: California: 1 ♂, Mill Valley, Marin Co., Aug. 6, 1957 (H. B. Leech, CAS).

Discussion: A third specimen mentioned by Sabrosky as probably this species from Clear Lake, Lake County, Calif., July 28, 1934 (E. C. Van Dyke, CAS), has been restudied and is *colei*. A fourth specimen recorded by Sabrosky as possibly being *colei* from Grass Valley, Calif., has been examined and found to be *borealis* Cole. A female specimen from the new locality above, and collected on Aug. 1, 1957, has been seen and may be this species, but if so, shows a degree of sexual dimorphism not heretofore noted in *Ogcodes* species. It is also possible that this female represents a species of the *pallidipennis* group, perhaps *adaptatus*. In any case, I note the following female characteristics which differ from the male of *colei* as compared with the male specimen above, with the idea of pointing out the possibility that sexual dimorphism exists here as has been shown for other genera of the Acroceridae (see Schlinger, 1956).

Female: Head one-half as large as male; abdomen dark brown, not patterned, but with vary narrow posterior white fasciae

on tergites, much wider ones on sternites; abdomen with short pile about as in *adaptatus;* legs dark brown, only knees light brown; venation entirely unlike that of male (shown in pl. 4, fig. 21), being more like that shown for *gibbosus* (in pl. 3, fig. 13) except r-m crossvein much shorter, thus crossvein m-cu absent, vein M_1 faint, not joining R_{4+5} as in male, anal vein separated from vein Cu_2 towards wing margin, but veins M_2, M_4, Cu_2 and R_{4+5} as in male; squama heavily infuscated.

If this specimen represents the female sex of *colei*, which I believe to be the case, then one might speculate on the reason for the great venational differences occurring between the sexes. It might be that since the ovipositional habits of the known species (see biology section) show that females may spend the majority of their adult lives resting or walking on dead twigs depositing eggs, and since flight may be only instigated during mating, that a weaker or more simplified type wing venation evolved in the female sex; while the need for flight in the males, in order to better search out the resting females, has perhaps mandated the need for a primitive, and hence stronger type, wing venation. Although this does not appear to be the case in the closely related *vittisternum*, this condition might occur in *borealis*, in which case it might help to explain the wing venational differences observed there (see under *borealis* above).

Females of the other known Nearctic species of the *colei* group, i.e., *floridensis* and *shewelli*, are unknown, so that a comparison cannot be made with these species at this time. However, a similar situation may exist with *niger* (see below). Also, if dimorphism of this type should be proved, keys to the individual sexes would be a necessity.

Text figure 3 shows the relationships of *colei* to the Nearctic *Ogcodes* species, and there is little doubt that *vittisternum* is its closest relative.

Ogcodes (*Ogcodes*) *vittisternum* Sabrosky

PLATE FIGURES 63, 96

Ogcodes vittisternum Sabrosky, Amer. Mid. Nat., vol. 39, p. 420, pl. 1, figs. 2–3, 1948.

DIAGNOSIS: Species of group IV. Male abdomen patterned, without obvious tergal white fasciae, similar to *colei* but tergite III with distinct brown lateral spots; venter in both sexes with median and lateral brown spots on each sternite; venation as in *colei* (pl. 4, fig. 21); male genitalia similar to *colei* but the aedeagus is not as acuminate (pl. 10, fig. 63) and ejaculatory apodeme stronger, more like *shewelli* (pl. 12, fig. 96).

TYPE: Holotype ♂, Homestead Inn, Mount Hood, Oregon, July 6, 1927 (E. C. Van Dyke, FRC).

New distribution record:

Washington: 1 ♂, 1 ♀, Spokane, Aug. 6, 1924 (A. L. Melander, ALM).

Discussion: The male specimen from Washington has been compared with the holotype (♂) and is certainly conspecific. Although *vittisternum* is closely related to *colei* as stated above, it is undoubtedly closer to the New Zealand species, *leptisoma*, in spite of the great geographical separation (see discussion on the comparison of the New Zealand and the North American faunae above).

The female specimen from Washington does not differ structurally from the male, as was found to be the case in *colei* (see above). However, the female is not patterned as is the male but rather has the entire abdominal dorsum light brown, venter mostly dirty whitish brown, legs light brown, short abdominal pile, infuscated squama, and the head about one-half as large as the male. Most of the female characters agree with those found above for the female of *colei*, except that *vittisternum* shows no venational differences between the sexes.

From the phylogenetic standpoint, *vittisternum* is an interesting species since it seems likely that it gave rise to *albiventris* (Johnson), which now forms the new subgenus *Neogcodes* (see text fig. 3).

Ogcodes (*Ogcodes*) *floridensis* Sabrosky

Ogcodes floridensis Sabrosky, Amer. Mid. Nat., vol. 39, p. 421, pl. 1, fig. 4, pl. 2, fig. 19, 1948.

Diagnosis: Species of group iv. Male abdomen patterned, without tergal white fasciae; tergite ii entirely yellow, iii, iv with three brown spots, the median one triangular; venter apparently mostly yellow with faint lateral brown spots as in *vittisternum*, but no median row of spots; halter black with yellow stalk; venation about as in figure 21; male genitalia similar to *vittisternum*, but the aedeagus more acuminate apically and somewhat broader subapically than in plate 10, figure 63 (see Sabrosky, 1948, pl. 2, fig. 19).

Type: Holotype ♂, Brevard County, Florida, Sept. 22, 1929 (Julian Howard, USNM 58365).

Discussion: Although this species is superficially related to *vittisternum*, it is apparently closer to *shewelli*, and thus to the New Zealand species *nitens*. I have not examined the holotype of *floridensis*, but by studying its original description in connection with specimens of *nitens*, *shewelli*, and *vittisternum* there seems to be little doubt of this association.

Although *floridensis* is at present known only from the holotype male, this is not surprising since *Ogcodes* specimens in general are very uncommon throughout the Austroriparian region. In fact, I know of only two other records from Florida.

Ogcodes (Ogcodes) shewelli Sabrosky

Plate figures 62, 97

Ogcodes shewelli Sabrosky, Amer. Mid. Nat., vol. 39, p. 422, pl. 1, fig. 6, pl. 2, fig. 20, 1948.

Diagnosis: Species of group iv. Male abdomen patterned, without tergal white fasciae; tergites ii-iv yellow with only small brown median triangular spots; venter entirely pale yellow except for faint infuscation on sternite i; venation about as in plate 4, figure 21; male genitalia yellow; aedeagus as in plate 10, figure 62, ejaculatory apodeme small as in plate 12, figure 97.

Type: Holotype ♂, Niagara Glen, Ontario, Canada, July 27, 1925 (G. S. Walley, CNM).

New distribution record:

New York: 1 ♂, Cold Spring Harbor, July 27, 1927 (A. L. Melander, ALM).

Discussion: This colorful species has close affinities with both *floridensis* and *nitens*, and actually appears to be closer to the latter species in most respects, even though *floridensis* and *shewelli* occur in North America while *nitens* is restricted to New Zealand.

Because this species is so little known, it seems worth while noting that both of the known specimens were collected on the same day, even though two years apart and at separate localities. It may be that the adults of this species have a very short spatial existence, a fact which could account for its rareness in collections. The more plausible reason, however, seems to be that *shewelli* (as well as all known members of the *colei* group in North America) has difficulty in competing with such widespread and adaptive species as *adaptatus*, *eugonatus*, and *pallidipennis*.

Ogcodes (Ogcodes) niger Cole

Ogcodes niger Cole, Trans. Amer. Ent. Soc., vol. 45, pp. 65–66, pl. 15, fig. 41, 1919; Psyche, vol. 30, p. 48, 1923.—Sabrosky, Amer. Mid. Nat., vol. 31, p. 389, 1944; Amer. Mid. Nat., vol. 39, p. 427, 1948.

Diagnosis: Species of group iv (?). Female body shining black, antenna whitish; femora darkened, knees, tibiae and tarsi whitish; vein M_1 present but apparently faint, r-m crossvein absent, m-cu crossvein present (extracted from Cole, 1919).

Type: Holotype ♀, Stockton, Utah, July 11, 1916 (T. Spaulding, MCZ).

Discussion: I have not seen this species, and apparently there are no specimens known except the holotype female. Sabrosky (1948, p. 427) examined the type and concluded that the species was unrecognizable to him. I have tentatively placed it in the *colei* group on the basis of vein M_1 being present, r-m crossvein being absent, and

m-cu crossvein being present. As far as its distribution and color characters are concerned, however, it could represent an atypical specimen of several species, such as *borealis*, *adaptatus*, or *eugonatus*. Nevertheless, Cole's figure of *niger* plainly shows crossvein m-cu present, a character not found in other species of either the *eugonatus* or *pallidipennis* groups. The presence of crossvein m-cu together with the fact that females are unknown for most species of the *colei* group suggest that *niger* probably belongs in this latter group. That females of the strikingly patterned males of the *colei* group should be of the simple fasciated type has now been partially verified by an examination of females of both *colei* and *vittisternum*, as well as (*Neogcodes*) *albiventris*.

A possibility that the wing venation of *niger* females may be different from *niger* males was discussed under *colei* (see above).

Ogcodes (*Ogcodes*) *pallidipennis* Loew

Plate figures 36, 102

Oncodes pallidipennis Loew, Berliner Ent. Zeit., vol. 9, p. 149, 1865.

Oncodes costatus Loew, Berliner Ent. Zeit., vol. 13, p. 165, 1869.—Melander, Ent. News, vol. 13, p. 178, 1902.—Malloch, Bull. Illinois State Lab. Nat. Hist., vol. 11, p. 341, pl. 81, fig. 23, 1915; Bull. Illinois State Nat. Hist., vol. 12, p. 368, pl. 53, fig. 1, 1917.—Gillette, State Ent. Colorado Cir., vol. 43, p. 49, figs. 8–9, 1924.

Oncodes incultus Osten Sacken, Bull. U.S. Geog. and Geol. Surv., p. 279, 1877.

Oncodes humeralis Osten Sacken, (type ♂, MCZ, northern Sonora, Mexico), Biol. Ent. Amer. Dipt., vol. 1, p. 164, 1887. New synonymy.

Oncodes aedon Townsend, (type ♂ (?) destroyed; Baja Purisima, Baja California, Mexico), Proc. California Acad. Sci., ser. 2, vol. 4, p. 607, 1895. New synonymy.

Ogcodes melampus, Cole, in part, Trans. Amer. Ent. Soc., vol. 45, p. 62, 1919 (not Loew, 1872).

Ogcodes incultus, Cole, Trans. Amer. Ent. Soc., vol. 45, p. 62, 1919.—Cole, et al., Proc. Ent. Soc. Washington, vol. 26, p. 182, 1924.

Ogcodes pallidipennis, Cole, in part, Trans. Amer. Ent. Soc., vol. 45, p. 63, 1919; Psyche, vol. 30, p. 48, 1923.—Cole, et al., Proc. Ent. Soc. Washington, vol. 26, p. 182, 1924.—Sabrosky, in part, Amer. Mid. Nat., vol. 31, p. 392, 1944; Amer. Mid. Nat., vol. 39, p. 415, 1948 (not figures).

Ogcodes costatus, Cole, Trans. Amer. Ent. Soc., vol. 45, p. 64, pl. 14, fig. 40, 1919.—Cole, et al., Proc. Ent. Soc. Washington, vol. 26, p. 182, 1924.—Cole, Proc. California Acad. Sci., vol. 16, p. 422, figs. 80 and 82, 1927.—Kaston, Journ. New York Ent. Soc., vol. 45, p. 416, figs. 1–5, 1937.

Ogcodes humeralis, Cole, Trans. Amer. Ent. Soc., vol. 45, p. 64, 1919.—Sabrosky, Amer. Mid. Nat., vol. 31, p. 389, 1944; Amer. Mid. Nat., vol. 39, p. 427, 1948.

Ogcodes aedon, Cole, Trans. Amer. Ent. Soc., vol. 45, p. 65, 1919.—Sabrosky, Amer. Mid. Nat., vol. 31, p. 389, 1944; Amer. Mid. Nat., vol. 39, p. 427, 1948.

Diagnosis: Species of group v, with white tergal fasciae as in plate 5, figure 29, characterized by its reddish brown appearance (rarely all blackish brown), black mesonotum, brown scutellum,

light brown, yellow, or white postalar callus and humerus; venation as in plate 3, figure 11; male genitalia large; aedeagus as in plate 7, figure 36; ejaculatory apodeme as in plate 13, figure 102.

TYPE: Holotype ♀, Pennsylvania (Osten Sacken, MCZ).

DISTRIBUTION: This is one of the most commonly encountered and widely distributed species of Nearctic *Ogcodes*. It spreads throughout the middle and northeastern United States and southern Canada, becomes less frequent in the west where it is known only in southern California, and ranges south through Mexico to Costa Rica (see text fig. 7).

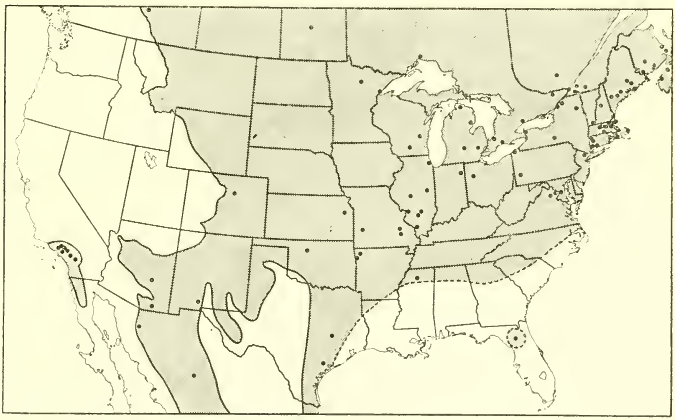

FIGURE 7.—Distribution of *Ogcodes pallidipennis* Loew in the United States.

RECORDED DISTRIBUTION: The following state records represent only those specimens which have been reexamined or those which were cited by Sabrosky (1944, 1948) and about which there seems little doubt: Arkansas, Baja California (*aedon* Townsend), Connecticut, District of Columbia, Illinois, Indiana, Kansas, Maine, Manitoba, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Brunswick, New Hampshire, New Jersey, New York, Ohio, Ontario, Pennsylvania, Sonora (*humeralis* Osten Sacken), Texas, Vermont, Virginia, and Wisconsin.

NEW DISTRIBUTION RECORDS: (170 specimens, 95♂, 75♀).

ALBERTA: 1♀, Sundre, July 12, 1946, on poplar tree (CNM).

ARIZONA: 1♀, Globe, July 18, 1935 (F. Parker, EIS); 1♀, Carr Canyon, Huachuca Mts., Cochise Co., Aug. 1905 (H. Skinner, PANS).

ARKANSAS: 2♀, Fayetteville, May 30 to June 10, 1933 (H. H. Schwardt, CU).

California: 2♂, 1♀, Fish Canyon, San Gabriel Mts., Los Angeles Co., reared, various dates (E. I. Schlinger, EIS); 3♂, Glendale, Los Angeles Co., Aug. 4, 1950, in window sill, July 27, 1952, and June 30, 1950, dead in spider web (W. M. and E. I. Schlinger, EIS); 1♀, Redlands, April 30, 1924 (FRC); 1♀, Idyllwild, San Jacinto Mts., June 17, 1940 (E. G. Linsley, CIS); 1♂, 1♀, Riverside, Sept. 4, 1926, (♂), June 8, 1950 (♀) (P. H. Timberlake, UCR); 1♀, Whittier, Los Angeles Co., Sept. 30, 1930, "on avocado" (Bartholomew, LAM); 1♂, Tanbark Flat, Los Angeles Co. (D. D. Sprague, UCD); 1♀, Pasadena, Los Angeles Co. (J. M. Aldrich, USNM).

Colorado: 1♀, Cascade, Aug. 20, 1903 (AMNH).

Connecticut: 1♀, Litchfield, June 12, 1936 (R. B. Friend, CAES): 1♂, Culibrook (Colebrook?), June 24, 1914 (C. G. Hewitt, CNM).

Costa Rica: 3♀, La Suiza, Jan. 7 to Feb. 20, 1924 (P. Schild, ALM, EIS).

District of Columbia: 1♂, Aug. 18, 1886 (USNM).

Florida: 1♀, W. of Gainesville, April 18, 1938 (W. J. Gertsch, AMNH).

Illinois: 1♀, Algonquin (C. W. Johnson Collection, ALM); 1♂, Oxville, Scott Co., Aug. 22, 1948 (W. Nutting, WSC).

Iowa: 1♀, Des Moines, June 14, 1953 (J. Parks, JP).

Kansas: 1♂, Douglas Co., elev. 900 ft. (UK); 1♂, Lawrence, June 9, 1922 (C. H. Curran, CNM).

Maine: 3♀, Murphy Lake, Bar Harbor, July 5, 1928 (MSC); 1♀, Monmouth, July 14, 1916 (M. C. VanDuzee, CAS); 1♀, Mt. Desert Island, July 10, 1929 (AMNH); 4♂, 4♀, Augusta, June 12 to July 27, 1939 to 1944 (A. E. Brower, AMNH); 1♂, Bar Harbor, Mt. Desert Island, No. 6241, July 8, 1938 (A. E. Brower, AMNH); 7♂, 5♀, S. Bristol, July 27, 1935 (AMNH); 1♂, Kokadjo, July 15, 1941, beaten from spruce (AMNH).

Manitoba: 2♀, Aweme, July 25, 1916, and July 3, 1923 (N. Criddle and H. A. Robertson, CNM).

Massachusetts: 3♂, 1♀, Petersham, June 1932 (C. T. Brues, ALM, EIS); 2♂, Eastham, July 11, 1944 (C. P. Alexander, MSC); 1♀, Berlin, July 2, 1917 (MSC); 1♂, Phillipston, June 12, 1922 (H. H. Shepard, MSC); 1♀, Hemps Co., June 1922 (P. A. Readio, CNM); 1♂ "Mass." (W. M. Wheeler, AMNH).

Mexico: 1♂, Guadalajara, Jalisco, 1909 (McConnell, CM); 1♀, Sierra Madre, head of Río Piedras Verdes, Chihuahua, alt. 7,300 ft., July 15 (Townsend, USNM) [recorded by Sabrosky, 1948, as west. subsp. of *pallidipennis*].

Michigan: 1♂, Iosco Co., June 20, 1940 (R. R. Dreisbach, RRD).

Minnesota: 1♀, Itasca Park, July 2, 1941 (C. E. Mickel, UM); 1♂, Sucker River, Lake Superior, St. Louis Co., July 4, 1938 (D. G. Denning, UM).

Missouri: 1♂, Arcadia, May 31, 1943 (R. C. Froeschner, RCF); 1♂, Des Arc, May 31, 1943 (R. C. Froeschner, RCF).

New Brunswick: 1♂, Fredericton, July 2, 1930 (R. P. Gorham, CNM); 1♂, Shediac, July 2, 1939 (W. J. Brown, EIS); 1♂, St. Andrews, June 28, 1938 (T. N. Freeman, EIS); 1♀, Harcourt, July 10, 1918 (M.B.D., CNM).

New Hampshire: 3♂, 3♀, Franconia (Mrs. A. T. Slosson, AMNH)

New Mexico: 1♀, Mesilla Dam, April 24, 1934 (GEB) and 1♀, Rociada, Aug. 8 (Cockerell, USNM) [both recorded by Sabrosky, 1948, as western subspecies of *pallidipennis*].

New York: 1♂, Ithaca, July 26, 1916 (H. K. Knight, UM); 1♂, Ithaca, July 11, 1941 (J. N. Belkin, UCLA); 1♂, 1♀, in copula, Ithaca, June 25 (CU), 1♂, Niagara Falls, Aug. 17, 1907 (M. C. VanDuzee, CAS); 1♀, Wells, July 27, 1914 (D. B. Young, NYSM); 1♂, Morristown, July 8 to July 14 (CM); 1♀, Grand Island, June 26, 1910 (M. C. VanDuzee, CAS); 1♀, Keene, June 24, 1920 (W. Wild, CAS).

Northwest Territory: 1♀, Reliance, June 1937 (W. J. G. Stewart, EIS).

Nova Scotia: 1♂, Smith's Cove, June 23, 1916 (CNM); 1♂, Truro, June 26, 1915 (CNM); 1♂, 1♀, Baddeck, July 10, 1936 and July 31, 1941 (T. N. Freeman, CNM); 1♂, Kings Co., June 25, 1931 (C. E. Atwood, CNM); 1♀, Mt. Denson, June 16, 1936 (CNM).

Ohio: 1♀, Allen Co., Aug. 7, 1949 (C. A. and W. E. Triplehorn, EIS).

Oklahoma: 1♂, Cleo Springs, June 5, 1937 (Standish-Kaiser, OAM).

Ontario: 7♂, Toronto, 1896 (Hough, CNM, ALM); 3♂, Thunder Bay Beach, June 26 to July 22, 1941 and July 1, 1942 (H.S. Parish, CNM); 1♀ (teneral), Rocklitte, July 24, 1928 (J. A. Adams, CNM); 2♀, Camlachie (W. Mickels, CNM); 1♀, Queenstown, July 15, 1934 (D. F. Patterson, CNM); 1♂, Grand Bend, July 8, 1939 (G. E. Shewell, CNM); 1♂, Ottawa, June 24, 1915 (C. B. Hutchings, CNM) [det. by Curran as a metatype of *O. melampus* Loew].

Pennsylvania: 1♂, 4♀, Morton, June 5, 1913 (PANS); 1♂, 1♀, Pittsburgh, June 19, 1911 and June 25, 1908 (H. Kahl, CM); 1♂, Erie, July 9, 1926 (H. Kahl, CM).

Quebec: 2♀ (teneral), Knowlton, July 22 and Aug. 7, 1929 (L. J. Milne, CNM); 1♂, 1♀, Clarenceville, July 15, 1933 (G. H. Hammond, CNM); 1♀, Rigaud, June 1906 (CNM); 5♂, 4♀, Abbotsford, June 1935, June 25, 1936, and June 22, 1937 (G. E. Shewell, CNM, EIS); 1♀, Georgeville, June 23, 1936 (G. S. Walley, EIS); 1♀, Aylmer, July 2, 1935 (G. S. Walley, CNM); 1♂, Nominique, June 13, 1941 (O. Peck, CNM).

Vermont: 1♀, Laurel Lake, Jacksonville, July 3, 1935 (H. Pratt, UM).

Virginia: 1♀, Warrenton, May 30, 1928 (L. C. Woodruff, UK); 7♂, Falls Church, Aug. 26 to 31, and Sept. 5 to 20, 1912 to 1916 (C. T. Green, USNM).

West Virginia: 1♂, Fairmont, July 1942 (R. B. Bennett, ALM).

Wisconsin: 9♂, Milwaukee (MPM); 2♂, "Wis." (W. M. Wheeler, AMNH); 1♂, Fond du Lac Co. (UW); 1♀, Madison, July 14, 1935 (H. R. Dodge, EIS).

Seasonal occurrence: Males appear from May 31 (Des Arc, Mo.) to Sept. 4 (Riverside, Calif.), females from Apr. 18 (Gainesville, Fla.) to Sept. 30 (Whittier, Calif.). Specimens collected in Riverside, Calif., as early as June 8 (♀) and as late as September 4 (♂) indicate that *pallidipennis* may have, at least in that area, a rather continuous generation, or at least a longer flight period than is known for most species of *Ogcodes*.

Recorded hosts: *Pardosa saxatilis* (Hentz) and a *Lycosa* species were recorded by Kaston (1937) from Connecticut (see also table 1).

New host records: Ten specimens were reared by the author from the following spiders collected in Los Angeles County, Calif., during the years 1943–1950:

Steatoda palomara Chamberlin and Ivie, immature, collected at Glendale. Parasite (♀) emerged as an adult Sept. 7, 1943.

Walmus species, immature, collected at Fish Canyon, San Gabriel Mts. Parasite (♂) emerged from host June 11, 1944, pupated June 13, emerged as adult June 21, and died July 3, 1944.

Xysticus montanensis Keyserling, immature, collected at Glendale. Parasite (♀) emerged from host Aug. 11, 1946, pupated Aug. 13, emerged as adult Aug. 24, and died Sept. 1, 1946.

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Hololena curta McCook, mature ♀, collected at Glendale. Parasite (♀) emerged from host May 17, 1949, pupated May 19, emerged as adult May 24, and died June 2, 1949.

Hololena curta McCook (?), immature, collected at Glendale. Parasite (♀) emerged from host May 25, 1949, pupated May 26, emerged as adult June 2, and died June 6, 1949.

Hololena curta McCook (?), immature, collected at Glendale, Parasite (♀) emerged from host July 31, 1949, pupated Aug. 1, emerged as adult Aug. 6, and died Aug. 11, 1949.

Hololena curta McCook (?), immature, collected at Glendale. Parasite (♀?), pupated Jan. 21, 1950, started to emerge on January 27 but did not completely emerge from the pupal skin. Even though it was not fully emerged, the fly lived until Feb. 1, 1950, or five days.

Hololena curta McCook (?), immature, collected at Fish Canyon, San Gabriel Mts. Parasite (♀) pupated Mar. 31, 1950, emerged as adult Apr. 6, and died Apr. 12, 1950.

Hololena curta McCook (?), immature, collected at Glendale. Parasite (♂) emerged from host Apr. 4, 1950, pupated Apr. 7, emerged as adult Apr. 12, and died Apr. 17, 1950.

Herphyllus species, immature, collected at Glendale. Parasite (♂) first seen as prepupa Apr. 8, 1950, pupated Apr. 10, emerged as adult Apr. 14, and died Apr. 18, 1940

Biology: Schlinger (1952) reported *Hololena curta* McCook as a rather common host of the acrocerid *Opsebius diligens* Osten Sacken. The records cited above for *pallidipennis* and unpublished records of *Acrocera melanderi* Cole attacking the same host indicate considerable competition for this host. All specimens of the host *Hololena curta* collected at Glendale, Calif., were taken from the same hillside within a 100 ft. sq. area, which would indicate that considerable competition existed for this specific host between the parasites of at least three genera of acrocerids.

From the available biological information, it appears that *pallidipennis* agrees in most respects with other *Ogcodes* species. Malloch (1915, 1917) recorded and figured the pupal skin from Illinois. Gillette (1924) reported a peculiar case of egg-laying in which the parasite flew into a house in Colorado and deposited nearly 3,000 eggs in about one hour on a small piece of cloth. Kaston (1937) has discussed and figured the posthost developmental stages in Connecticut.

As indicated from the new rearing data cited above, the average periods of time involved in the various developmental stages were as follows: Emergence from host to pupation was 1.8 (1–3) days; pupal period was 6.5 (4–11) days; adult longevity under poor laboratory conditions was 6.5 (4–12) days. In nature, adults of *pallidipennis* would no doubt live much longer, perhaps 20–30 days.

Discussion: The accumulation of specimens from southwestern United States, Mexico, and Costa Rica has increased the known dis-

tribution of *pallidipennis* greatly, and has allowed me to question the validity of *aedon* Townsend and *humeralis* Osten Sacken.

Specimens from Mexico, southern California, New Mexico, and Texas were compared with the original descriptions of *aedon* and *humeralis*. No specific differences could be detected, and an examination of the male genitalia of the Guadalajara specimen revealed it was typical *pallidipennis*. The female from Chihuahua was a little darker than that described for *humeralis*, but the type of the latter was stated to be a male, and the males of *pallidipennis* are usually lighter than the females.

The type of *aedon* was destroyed in the California Academy of Sciences Museum in the San Francisco fire of 1906. Townsend (1895) said in his original description: "Very similar to *Oncodes humeralis* O.S., but differs in the tegulae being fuscous whitish with well defined narrow dark brown margins." This latter character appears to be the only one which might differentiate *aedon* from *humeralis* and *pallidipennis*. However, it has been found that the degree of infuscation of the squama in species of the *pallidipennis* group is somewhat variable, and is therefore a doubtful specific character (see discussion under *adaptatus*). Since the other specific characters mentioned in the descriptions of *aedon* and *humeralis* agree well with *pallidipennis*, and since the range of the latter is now known to extend well beyond the limits of the type localities of the two species involved, it seems reasonable to suspect this synonymy.

Many earlier authors have confused *pallidipennis* with such species as *eugonatus* and *melampus* and with specimens now known to be *adaptatus*, new species. Sabrosky (1944, p. 392) was the first to recognize that synonymy was involved and noted that *costatus* was the light-colored male and *incultus* the dark-colored female of *pallidipennis*. The specimens cited above from Costa Rica are of this dark "*incultus*" form.

Light-colored specimens of *borealis* and dark-colored specimens of *dispar* also might be confused with *pallidipennis* females. However, the characters given in the key to the species should be sufficient to separate them.

I believe that *pallidipennis* is the most primitive member of group v in North America and presume that it gave rise to the closely related *dispar* (see text fig. 3). The European species *varius* is quite closely related to both of the former species as well as to the Nearctic *rufoabdominalis*. The male genitalia will separate all the above species as well as *adaptatus*. The last, although not closely related, has been associated with *pallidipennis* by Sabrosky (1948) and Kessel (1948).

The largest specimen I have seen was a female from Costa Rica whose length was 9 mm. and whose wing length was 10 mm. The smallest specimen seen was a female from Petersham, Mass., which measured only 2.5 mm. in length.

Ogcodes (*Ogcodes*) *dispar* (Macquart)

Plate figures 33, 35

Henops dispar Macquart, Dipt. Exot., Supp., vol. 5, p. 67, pl. 2, fig. 12, 1855.
Ogcodes dispar, Cole, Trans. Amer. Ent. Soc., vol. 45, p. 66, pl. 14, fig. 39, 1919.—Cole, et al., Proc. Ent. Soc. Washington, vol. 26, p. 182, 1924.—Sabrosky, Amer. Mid. Nat., vol. 31, p. 390, 1944; Amer. Mid. Nat., vol. 39, p. 412, 1948.—Farr, Bull. Brooklyn Ent. Soc., vol. 48, p. 39, 1953.
Oncodes dispar, Champlain and Knull, Ent. News, vol. 34, p. 211, 1923.
Oncodes vittatus Johnson, Psyche, vol. 30, p. 50, 1923.
Ogcodes vittatus, Sabrosky, Amer. Mid. Nat., vol. 31, p. 391, 1944.

Diagnosis: Species of group v with typical posterior tergal fasciae (fig. 29), but usually more yellow or brownish yellow than in most species; spiracular area much darker than surrounding ground color; thorax yellow or dark orange in ground color, with or without one to three dark vittae; venation as in plate 3, figure 11; aedeagus as in plate 7, figure 35; ejaculatory apodeme (pl. 6, fig. 33) about as in plate 13, figure 102 for *pallidipennis*.

Type: ♂ and ♀, on the same pin, Baltimore, Md. (Muséum National d'Histoire Naturelle, Paris).

Distribution: This is a widespread but rather uncommon species which ranges throughout eastern North America, north to Quebec

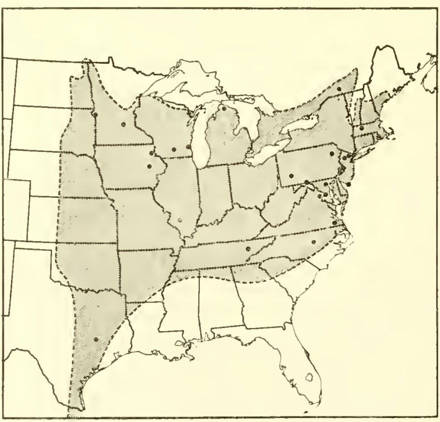

Figure 8.—Distribution of *Ogcodes dispar* (Macquart) in the United States.

and south through Texas to Costa Rica. There are, however, no Mexican records, and the available ones from the Austroriparian Zone of southeastern United States are few (see text fig. 8).

Recorded distribution: Arizona (doubtful record), District of Columbia, Illinois, Iowa, Maryland, Massachusetts, North Carolina, Pennsylvania, Quebec, Texas, and Virginia.

New distribution records: (25 specimens, 14♂, 11♀.)

Costa Rica: 1♂, La Suiza, June 16, 1924 (P. Schild, EIS).

Iowa: 1♂, McGregor, July 1, 1950 (Hicks, Slater, ISC).

Michigan: 1♂, Cheboygan Co., July 18, 1949 (A. C. Reneau, ISC).

Minnesota: 1♀, Lake Minnetonka, Enchanted Isle, June 26, 1932 (E. R. Tinkham, UM); 1♀, Big Stone Co. (O. W. Oestlund, UM).

New Jersey: 1♂, Cape May, Aug. 13, 1896 (W. Stone, PANS); 1♀, Boonton, June 16, 1901 (G. M. Green, USNM); 1♂, 1♀, Ramsey, June 29, 1941 (♂), July 13, 1941 (♀), (W. J. Gertsch, AMNH, EIS).

New York: 1♀, New Rochelle, June 1, 1932 (L. Lacey, AMNH).

Pennsylvania: 1♂, Pittsburgh (ALM); 1♀, Swarthmore, Aug. 19, 1906 (E. T. Cresson, Jr., PANS); 1♂, Westmoreland Co. (CM); 1♂, Jeannette, June 21 (CM).

Quebec: 1♀, Montreal, July 7, 1912 (E. P. VanDuzee, CAS).

Tennessee: 1♀, Knoxville, Sept. 10, 1948 (D. W. Pfitzer, UT).

Virginia: 1♂, Falls Church, Aug. 27, 1916 (C. T. Greene, USNM).

Wisconsin: 1♀, Madison, June 22, 1929 (M. H. Doner, UW); 4♂, 2♀, Milwaukee (MPM).

Seasonal occurrence: Males have been taken from March 28 (College Station, Tex.) to August 27 (Falls Church, Va.), and females from May 8 (Great Falls, Va.) to November 10 (Knoxville, Tenn.).

Recorded hosts: None.

Biology: Little has been known until recently. Champlain and Knull (1923) reported locating in Pennsylvania a wasp nest in a log which, when opened, contained several nicely preserved specimens of *dispar*. Along with these were remains of spiders which presumably were their hosts that had been stored by a spider wasp. Farr (1953) observed this species in Massachusetts in what was apparently a mating swarm. The flies were observed about 12 feet above the ground, and were flying in zig-zag fashion. Occasionally one would depart from the swarm and land on a twig or leaf of a certain white ash (*Fraxinus americana* L.), which stood about 5 feet high. I have examined several examples of the series collected by Farr and they were typical *dispar*.

Discussion: In its lighter coloration and darkened spiracular area, this species resembles *rufoabdominalis*. However, it is phylogenetically much closer to *pallidipennis*, the females being quite difficult at times to distinguish. *O. dispar* appears to be sympatric with *pallidipennis* throughout most of the latter's range, with many specimens having the same locality and date. When the mesonotal vittae are

present the species is easily distinguished from all of its relatives; otherwise, the combination of characters given in the key will be necessary to accurately define it. It also seems possible that the Mexican *dusmeti* Arias may turn out to be *dispar* (see discussion under *rufoabdominalis*).

Ogcodes (*Ogcodes*) *rufoabdominalis* Cole

Plate figure 34

Ogcodes rufoabdominalis Cole, Trans. Amer. Ent. Soc., vol. 45, p. 68, pl. 15, fig. 43, 1919; Psyche, vol. 30, p. 48, 1923.—Sabrosky, Amer. Mid. Nat., vol. 31, p. 389, 1944; Amer. Mid. Nat., vol. 39, p. 419, 1948.

Diagnosis: Species of group v. Both sexes have a yellowish orange to brownish orange abdomen with a narrow or broad median row of black, subtriangular spots and a row of small, dark brown, spiracular spots; the thorax is entirely black, the legs are brown with black infuscations; venation as in plate 3, figure 11; aedeagus as in plate 7, figure 34; ejaculatory apodeme as in plate 13, figure 102.

Types: Holotype ♂, Great Salt Lake, Utah, June 8, 1915 (M. C. VanDuzee, CAS). "Neotype ♀," mouth of Bear River, Utah July 11, 1915 (A. W. Wetmore, in the U.S. Biological Survey Collection) [designated by Cole, 1923, p. 48].

Distribution: This is a fairly common species which is apparently restricted to the Great Salt Lake Basin or Lake Bonneville area of Utah. The published records from Utah besides the type localities are Goshen, Spanish Fork, Saltair, and Locomotive Springs. The California specimen cited by Sabrosky (1948, p. 420) as *rufoabdominalis* has been examined and found to be a teneral female of *adaptatus*, new species.

New distribution records: (87 specimens, 18♂, 69♀.)

Utah: 4♂ 68♀, Gun Club Lakes, Salt Lake City, Aug. 22, 1955 (L. T. Nielsen, G. C. Collett, UU, EIS), some collected on *Scirpus* species; 1♂, Salt Flats (N. Fisher, UU); 3♂, West Salt Lake (Telford, UU); 1♂, Salt Lake City, July 31, 1948 (Knowlton and Houck, USAC); 1♀, Hot Springs, June 4, 1934 (Knowlton and Rowe, AMNH); 1♂, Ogden, June 15, 1942 (S. L. Wood); 1♂, June 20, 1937 (D. E. Hardy); 1♂, Provo, June 15, 1948 (G. F. Knowlton); 2♂, Payson, Aug. 13, 1943 (Knowlton and Maddoch); 1♂, Aug. 1 (Knowlton and Stains); 2♂, Brigham, June 10, 1938 (Knowlton et al.); 1♂, Far West, Aug. 10, 1938 (Knowlton and C. F. Smith) [all in USNM or USAC].

Seasonal occurrence: Males and females have been collected from May 21 (Saltair) to August 22 (Salt Lake City). Since both sexes have been taken together from May 21 to August 22, it would seem that a much longer flight period might be expected, possibly April to September.

Recorded hosts: None.

Biology: Unknown.

Discussion: The question of the relationship of *rufoabdominalis* to *dusmeti* Arias from Mexico was discussed by Sabrosky (1948, p. 419) and resulted in the questionable synonymy of the latter species. A thorough study of the original description of *dusmeti* does not reveal any significant differences between the two. However, since there are no available intervening records (Mexico to Utah), I feel it best to retain *dusmeti* as a distinct species with the hope that the type or topotypical material can be studied in the future to clarify its status.

Both Cole (1919) and Sabrosky (1948) noted the similarity of *rufoabdominalis* to *varius* Latreille from Europe. An examination of a small series of the latter species from Germany and Hungary (4 ♂, 2♀) showed the following distinctive features:

O. rufoabdominalis: Male genitalia with aedeagus more rounded apically (compare pl. 7, fig. 34 and pl. 8, fig. 47); humerus, postalar callus, and scutellum black; femora not usually heavily infuscated; spiracular area very dark in comparison to surrounding tergal area.

O. varius: Male genitalia with aedeagus rather pointed apically (pl. 8, fig. 47); humerus, postalar callus, and scutellum usually brown, not all black, if any; femora heavily infuscated; spiracular area hardly differentiated in color from tergum.

The females of *varius* are more similar to *pallidipennis* than to *rufoabdominalis*. Unquestionably, all three are rather closely related, a fact which points to a possible Holarctic connection in the recent past.

Ogcodes (*Ogcodes*) *dusmeti* Arias

Ogcodes dusmeti Arias, Bol. Soc. España Hist. Nat., vol. 20, p. 191, figs. 1, 2, 1920.

Types: ♂ and ♀, Mexico (Conradt, 1903). Although the types are said to be in the Museo Nacional de Ciencias Naturales, Madrid, I had direct correspondence with the Museum authorities and was unable to verify their presence.

Discussion: Species of group v, judging from the description and figure of wing venation. The status of this species was given by Sabrosky (1948) under *rufoabdominalis*, and is further discussed above under the latter. The type locality "Mexico" gives little help in understanding *dusmeti*, for we actually do not know whether it is a Nearctic or Neotropical representative. A study of the type material will be necessary to ascertain the correct placement of this species.

Ogcodes (*Ogcodes*) *adaptatus*, new species

Plate figures 1–5, 11, 24, 25, 29, 32, 41

Ogcodes melampus, Sabrosky, Amer. Mid. Nat., vol. 31, pp. 391–392, 1944 (not Loew, 1872).

Ogcodes pallidipennis (western subspecies ?), Sabrosky, in part, Amer. Mid. Nat., vol. 39, pp. 416–418, pl. 2, figs. 11, 14, 17, 1948 (not Loew, 1865).

Ogcodes pallidipennis, Kessel, Wasmann Collector, vol. 7, pp. 115–116, 1948 (not Loew, 1865).

Species of group v.

MALE: Length of entire specimen 4.75 mm., wing length 4.75 mm. Head entirely black except grayish black frons and dark brown antenna; antenna with one small apical seta on segment III (pl. 5, fig. 25).

Thorax black, covered with short, appressed, grayish white pile (pl. 1, fig. 3), somewhat longer and less appressed on upper pleura; legs with coxae, femora, tarsi black, tibiae black except for dark brown on basal three-fourths of inner surface and basal one-fifth of outer surface; wing hyaline, vein M_1 present throughout its length, but not extremely strong, longer than R_{4+5}, cross-vein m-cu completely absent, r-m crossvein present and distinct, vein M_2 short and pale (pl. 3, fig. 11); squama opaque white with light brown margin, halter dark brown.

Abdomen black with typical white posterior tergal fasciae occupying about one-fourth of each segment (pl. 1, fig. 3 and pl. 5, fig. 29), entire dorsum covered with sparse, short, appressed, white pile (pl. 1, fig. 3); sternites I and most of II black, median area brownish black, III–V brownish black with posterior margins a dirty white, wider medially, abruptly narrowed laterally; posterior white margins of IV–V occupy four-fifths of each segment medially.

Genitalia dark brown and black; aedeagus as shown in plate 7, figure 41; ejaculatory apodeme as in plate 6, figure 32.

FEMALE: Length of entire specimen 5.50 mm., wing length 6.70 mm. The same as described for the male except: Thoracic and abdominal pile with a slight golden tinge; pleural area immediately below wing base of several shades of brown; upper corner of metanotum brownish black; legs entirely black except knees narrowly brownish black; r-m crossvein and vein M_1 more pronounced; costal cell somewhat infuscated; posterior white tergal fasciae about one-half as wide; sternites mostly brownish black with dirty white posterior margins.

FIRST-INSTAR LARVA: Planidium consisting of 12 segments, each with various types of setae; a pair of granular eyes are located anteriorly on head; mouthparts consist of a pair of oral hooks and a strong buccopharyngeal armature; the penultimate segment has a pair of dorsal spiracles whose trachae branch once and run up into head segment; caudal segment consists of several pairs of distinct setae and hooks and a sucking plate (see pl. 2, figs. 4, 5).

PUPA: Apparently not differentiated from other known species (see pl. 1, fig. 1).

HOLOTYPE: Male, Sardine Creek, Mono County, Calif., elevation 8,500 feet, July 12, 1951 (E. I. Schlinger, CAS).

ALLOTYPE: Female, same data except June 28, 1951 (J. W. MacSwain, CIS).

PARATOPOTYPES: 914 specimens, 171♂, 743♀: 15♂, 13♀, June 28, 1951 (A. T. McClay); 60♂, 165♀, June 28, 1951 (J. W. MacSwain); 3♂, 2♀, June 28, 1951 (R. W. Morgan); 2♂, 1♀, June 28, 1951 (E. L. Silver); 4♂, June 28, 1951 (C. A. Downing); 20♂, 33♀, July 6, 1951 (A. T. McClay); 7♂, 94♀, July 11, 1951 (A. T. McClay); 8♀, July 11, 1951 (E. L. Silver); 8♂, 1♀, July 11, 1951 (R. W. Morgan); 3♂, July 11, 1951 (C. A. Downing); 21♂, 257♀, and ♂♀ in copula, July 12, 1951 (R. C. Bechtel); 1♂, 21♀, July 12, 1951 (W. H. Lange); 1♂, 12♀, July 12, 1951 (E. J. Taylor); 22♂, 132♀, and 3♂♀ in copula, July 12, 1951 (E. I. Schlinger).

Paratopotypic specimens will be deposited in lots of 10 or 20 in the following collections: AMNH, BMNH, CAS, CHM, CNM, CM, CMNH, CSDA, CU, CWS, DEI, FRC, INHS, ISC, MCZ, OSC, PANS, TAM, UBC, UCLA, UI, UK, UN, USNM, UM, UW, VNM, and WSC. Other paratopotypes have been deposited as follows: 205 specimens in the CIS collection, 192 specimens in the UCD collection, and 140 specimens in the author's collection.

PARATYPE VARIATION: The leg coloring varies somewhat, remaining black in the female, while a few males have the distal one-half of the femora dark brown. The squama, particularly in the female, is whitish opaque, light brown, or rarely heavily, evenly infuscated, the margins being white to black. The wing is hyaline in the male, while in the female it ranges from hyaline to quite heavily infuscated, the latter trait being rare and characteristic of large individuals. The wing veins are pale, light or dark brown, and commonly darker in the female. Vein M_1 and r-m crossvein, although always present, are faint in a few specimens. The male genitalia do not vary significantly.

This species is closely related to *boharti*, and somewhat less so to *pallidipennis*, a species with which it has been confused. The melanic coloration of *adaptatus* will usually distinguish it from other Nearctic members of the *pallidipennis* group, and the male genitalia occupy a rather intermediate position between *boharti* and *pallidipennis* (compare pl. 7, figs. 36, 41, 42). None of the topotypical specimens of *adaptatus* suggest *pallidipennis* in coloration, but rather resemble *malampus*, which is a member of the *eugonatus* group.

DISTRIBUTION: Western North America from southern California to Alaska (as shown in text fig. 9). Most of the specimens reported by Sabrosky (1948) as western *pallidipennis* have been examined, and those with the rather brownish black habitus were actually females of *adaptatus* in a teneral or postovipositional stage. Those specimens which he recorded from Arizona, British Columbia, Mexico, New Mexico, and Washington have been carefully studied and were found

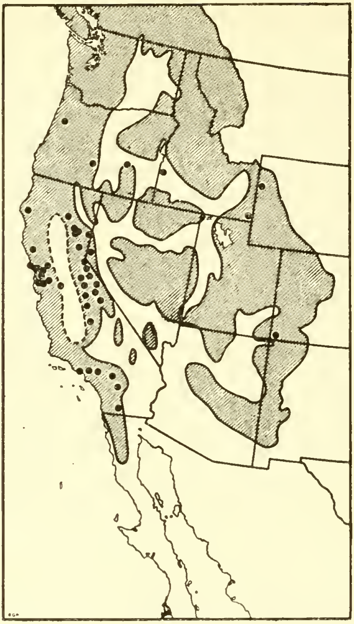

FIGURE 9.—Distribution of *Ogcodes adaptatus*, new species, in the United States.

to be one of three species, *boharti*, *borealis*, or *pallidipennis*. Since Sabrosky (1948) gave precise records of *adaptatus* for some 80 specimens, only those specimens representing new records are given below.

NEW DISTRIBUTION RECORDS: (363 specimens, 201 ♂, 162 ♀.)

ALASKA: 1 ♂, Alaska Highway, M.P. 1351, July 9, 1952 (C. P. Alexander, MSC); 1 ♂, Eagle, July 18, 1936 (F. Grinnell, EIS); 1 ♀, Livengood, July 30, 1954, "dead on window sill" (R. Coleman, USNM).

CALIFORNIA: 119 ♂, 76 ♀, and 4 pairs in copula, Bolinas, Marin Co., from April 6 to Oct. 15, 1947, to 1953 (R. M. Bohart, R. C. Bechtel, A. A. Grigarick, and E. I. Schlinger, USNM, EIS, UCD); 1 ♂, 1 ♀, Vallejo, Solano Co., Aug. 31, 1953 (E. I. Schlinger, EIS); 3 ♂, 13 ♀, Hallelujah Jct., Lassen Co., July 17, 1953 (E. I. Schlinger, EIS); 1 ♀, same place, July 12, 1954 (R. M. Bohart, UCD); 1 ♂, same place, July 4, 1949 (A. S. Deal); 1 ♀, same place, June 27, 1949 (R. L. Sisson); 1 ♂, same place, reared, May 30, 1950 (E. I. Schlinger, all EIS); 1 ♂, 1 ♀, Pinecrest, Tuolumne Co., July 25 and Aug. 2, 1947 (P. H. Arnaud, PHA); 1 ♀, same place, July 4, 1951 (S. M. Kappos, EIS); 1 ♀, same data (?), July 3, 1951 (C. A. Downing, EIS); 1 ♂, 1 ♀, Dinky Creek, Fresno Co., July 16, 1955 (R. X. Schick, UCLA); 10 ♂ and 8 ♀, reared, also 4 pupae and 3 larvae, Luther Pass, Grass Lake, El Dorado Co., July 24, 1955 (J. C. Downey, E. I. Schlinger, EIS); 1 ♂, Stanford University, Santa Clara Co., Aug. 20, 1949 (P. H. Arnaud, PHA); 2 ♀, Sagehen, near Hobart Mills, Nevada Co., June 25, 1954 (R. M. Bohart, R. C.

Blaylock, EIS, UCD); 1 ♀, Tapia Park, Santa Monica Mts., Los Angeles Co., June 12, 1954, reared (R. X. Schick, EIS); 2 ♀ (topotypes) July 17, 1953 (E. I. Schlinger, EIS); 1 ♀, Ash Mountain Reservation, Sequoia National Park, July 14, 1952 (R. C. Bechtel, EIS); 1 ♀, Biledo Meadow, Madera Co., July 11, 1946 (C. O. Eads, UCLA); 1 ♂, South Forks Meadow, June 25, 1948 (J. L. Sperry, ALM); 1 ♀, Del Rey (Banks Collection, Clarke, ALM); 4 ♂, 1 ♀, Niles, Aug. 22 to Sept. 5, 1932 (A. E. Michelbacher, CIS, USNM); 1 ♂, Pleasonton, Aug. 17, 1932 (A. E. Michelbacher, CIS); 1 ♂, Mill Creek, San Bernardino Co., 7,400 ft., June 29, 1942 (R. M. Bohart, EIS); 2 ♂, Tide Flat, Oakland, May 30, 1937 (E. S. Ross, CAS, GEB); 1 ♂, 2 ♀, Sebastopol, May 11 to 25, 1936 (A. T. McClay, UCD); 1 ♂, Buck's Lake, Plumas Co., July 14, 1949 (J. W. MacSwain, CIS); 1 ♀, Fish Canyon, San Gabriel Mts., Los Angeles Co., Apr. 27, 1949, reared (E. I. Schlinger, EIS); 1 ♀, Mt. Laguna, San Diego Co., July 5, 1950 (D. Cox, CIS); 1 ♀, Sunol, Alameda Co., May 24, 1933 (G. E. Bohart, GEB); 1 ♀, Round Valley, Inyo Co., July 27, 1947 (A. C. Michener, UK); 1 ♀, Mammoth Lakes, Mono Co., July 29, 1940 (L. J. Lipovsky, UK) [recorded as *rufoabdominalis* by Sabrosky, 1948, p. 420]; 1 ♀, Shingletown, Shasta Co., June 27, 1947 (T. F. Leigh, CIS); 1 ♀, Quincy, Plumas Co., June 21, 1949 (W. R. Schreader, EIS); 1 ♂, Yosemite, Tuolumne Co., June 10, 1928 (E. O. Essig, CIS); 1 ♂, Isberg Pass, Yosemite, July 30, 1940 (E. G. Linsley, CIS); 1 ♂, Hope Valley, Alpine Co., July 9, 1948 (S. A. Sher, CIS); 10 ♂, 2 ♀, Paradise Cove, Marin Co., May 3 to 18, 1947 (E. L. Kessel, CAS) [recorded as *pallidipennis* by Kessel, 1948]; 1 ♂, 3 ♀, Thompson Ranch, Grizzly Island, Solano Co., Aug. 21, 1952 (A. D. Telford, EIS); 1 ♂, Oakland, Alameda Co., August 1905 (E. C. Van Dyke, CAS) [det. as *melampus* by C. W. Johnson].

Colorado: 5 ♂, Ute Creek, 9,000 ft., July 2, 5, 19 and Aug. 7 (H. S. Smith, L. Bruner, R. W. Dawson, UN, EIS).

Idaho: 1 ♀, Prince Hardesty Res., Owyhee Co., July 3, 1954 (A. J. Walz, UI); 5 ♂, Marsing, Owyhee Co., Sept. 9, 1948 (A. Walz, UI, WSC, EIS); 1 ♂, Lava Hot Springs (D. E. Johnson, BYU).

Nevada: 2 ♂, 17 ♀, northwest side of Washoe Lake, Washoe Co., June 16, 1952 (E. I. Schlinger, EIS); 11 ♂, Minden, Douglas Co., June 11, 1957 (R. W. Lauderdale, EIS); 1 ♀, 9 mi. W. Fallon, Churchill Co., Sept. 18, 1957 (R. C. Bechtel, EIS).

Northwest Territories: 1 ♀, Yellowknife, July 20, 1949 (R. R. Hall, CNM).

Oregon: 3 ♂, 3 ♀, Corvallis, May 18, 1951 (V. Roth, J. Capizzi, OSC, EIS); 5 ♀, Rest Lake, near Summer Lake, Lake Co., July 23, 1944 (D. C. Mote, OSC); 1 ♂, 1 ♀, Fish Lake, Steen's Mts., Harney Co., July 14, 1953 (Roth and Beer, OSC).

Wyoming: 1 ♂, Wilson, July 22, 1926 (R. W. Haegele, UI); 1 ♀, Fhayne, July 26, 1952 (W. Furniss, USNM).

Yukon Territory: 1 ♂, 1 ♀, Dawson, July 8, 1949 (W. W. Judd, CNM).

Seasonal occurrence: Both males and females have been taken from Apr. 6 to Oct. 15 at Bolinas, Calif.; all the specimens from northern Canada and Alaska are dated July.

New host records: 27 specimens were reared from the following spiders, all collected in California. Nos. 7, 8, and 9 were observed by Mr. R. X. Schick of the University of California at Los Angeles, while the other specimens were reared by the author.

(1) *Pardosa sternalis* Thorell (?), immature, collected at Hallelujah Jct., Lassen Co. Parasite (♂) first noticed as teneral adult on May 30, 1950, died June 6, 1950.

(2) *Hololena* species, immature, collected at Fish Canyon, Los Angeles Co. Parasite (♀) emerged from host May 16, 1949, pupated May 18, emerged as adult May 24, and died May 29, 1949.

(3) *Pardosa sternalis* Thorell (?), immature, collected at Bolinas, Marin Co. Parasite (♀), emerged from host Jan. 13, 1950, pupated Jan. 14, emerged as adult Jan. 17, and died Jan. 20, 1950.

(4) *Pardosa sternalis* Thorell (?), immature, collected at Bolinas. Parasite (♀) emerged from host Oct. 10, 1949, pupated Oct. 12, emerged as adult Oct. 16, and died Oct. 20, 1949.

(5) *Pardosa sternalis* Thorell (?), immature, collected at Bolinas. Parasite (♀) emerged from host Jan. 17, 1950, pupated Jan. 19, emerged as adult Jan. 23, and died Feb. 4, 1950.

(6) *Pardosa sternalis* Thorell (?), immature, collected at Bolinas. Parasite (♀) emerged from host Oct. 10, 1949, pupated Oct. 12, emerged as adult Oct. 16, and died Oct. 19, 1949.

(7) *Xysticus cunctator* Thorell, immature, collected at Tapia Park, Los Angeles Co. Parasite (♀) emerged as adult June 12, 1954.

(8) *Xysticus cunctator* Thorell, immature, collected at Tapia Park, Los Angeles Co. Parasite (♀) emerged from host May 1, 1954, pupated May 3, emerged as adult May 5, 1954.

(9) *Philodromus* species, immature, collected at Sunland, Los Angeles Co. Parasite (♀) emerged as adult May 5, 1955.

(10–27) 9♂ and 9♀ parasites were reared from spiders collected at Luther Pass, El Dorado Co., July 24, 1955. The hosts for those that could be associated were *Pardosa* species, all immature. The parasites were collected under pieces of cow dung in a meadow either in the form of larvae, prepupae, or pupae. No accurate dates of developmental stages were kept, but the dates of adult emergence were from July 29 to Aug. 3, 1955.

Biology: From the above rearing data it can be said that the average posthost developmental periods were as follows: Emergence from host to pupation, 1.8 (1–2) days; pupal period, 3.8 (3–7) days; longevity of the adults under laboratory conditions, 6.6 (3–12) days. These few records compare well with those cited earlier for *pallidipennis*; only the pupal period of the latter differed to any extent—6.6 days as compared to 3.8 days for *adaptatus*.

The only published biological data which definitely can be associated with *adaptatus* were those of Kessel (1948). He observed the mating habits and was impressed by finding the flies rather gregarious, or at least common around only certain of the many *Juncus* plants in the area. Sabrosky (1948, p. 417) reported that some specimens had been stored by a crabronid wasp in Arizona, but these specimens actually represent the species described below as *boharti*, new species.

It seems worth-while at this point to make a few notes on the ecology of the type locality, and to describe the manner in which the unusually large type series was collected. Sardine Creek, Calif., the type locality, is a typical Sierran meadow at an elevation between 8,400 and 8,600 feet, just on the east side of Sonora Pass, and thus east of the Sierra Divide. The meadow contains a fairly swift and

narrow creek, which is unevenly bordered by several types of meadow grass, wild flowers, and a species of *Iris*. The grassy area is rather narrow, usually not more than 25 feet from the water to the higher ground. At the junction of the grass area and the higher ground, large patches of sagebrush, *Artemisia* species, is located. It was in this grassy area that the preponderance of spiders was observed, and it was on the dead twigs of the *Artemisia* that J. W. MacSwain and A. T. McClay first collected their specimens on June 28, 1951. On July 12, 1951, I made a special trip to this location to check the remarkable account given by the primary collectors. The trip resulted in the following observations.

The black parasite eggs were so thick on the dead outer twigs that they were easily noticed at a distance of 20 or more feet. Upon closer examination, large numbers of adult female flies, sometimes as many as 20 to 30 per twig, could be seen slowly walking up or down the twig laying about one egg every 3 to 4 seconds in a very rhythmic fashion. Some of the twigs were test-counted, and it was estimated that they contained from 15,000 to 20,000 eggs per linear foot. Occasionally a male landed on a twig, but most of the males observed and collected were found flying among, or resting upon, the inner branches of the sagebrush. Since most of the specimens of *adaptatus* were collected by actually picking them from the dead twigs by hand, the absence of males and the preponderance of females is self-explanatory. It was noted, also, that about one-tenth of the available dead twigs contained large masses of eggs and/or adult flies. The dead twigs themselves were uncommon, and in no case were these twigs observed with only a few eggs.

Considering this last statement, it would seem that some sort of association mechanism was acting on the adult females; otherwise, some twigs would have been found with either a few eggs, a few adults or a few of both. Whether this is a sight or smell relationship I am not sure, but the rapid rate of egg laying, together with the large number of adults found per twig, indicated a "follow-the-leader" condition in which somehow the females were attracted to the site where the first female began her egg deposition. I observed this condition also at Bolinas, Calif., on *Juncus patiens* E. Meyer, and at Washoe Lake, Nev., on *Chrysothamnus* species. Kessel's observations (1948) would also suggest this condition.

A few topotype females were also observed laying eggs on the dead flower stalks of an *Iris* species which was adjacent to the sagebrush. These stalks also bore large masses of eggs.

The first-instar larvae were seen "crawling" or "standing" on the egg masses in typical *Ogcodes* fashion (see main biology section), so

that they could either contact the spider host on the twigs at night or drop to the ground to encounter their host.

The spiders which prevailed in this area were mostly *Pardosa* species, including the common host species *sternalis* Thorell. These hosts were common only in the grassy and wetter part of the meadow, and were not seen venturing far onto the higher and dryer ground. This is significant, since the adult parasites were likewise neither encountered flying nor laying eggs much beyond the margin of the wetter area. Thus, the parasite-host relationship seemed well established along this line. Although no parasites from the type locality were reared, several pupae were found under rocks and dead twigs lying on the ground in the wet area.

The entire type series (914 specimens) was collected between June 28 and July 12, 1951, and although the author made another trip to the locality on Aug. 1, 1951, no specimens could be found in the area where only three weeks earlier the flies were present literally by the thousands. This suggests that the active adult period at this altitude is quite limited as compared with the sea level locality of Bolinas, Calif., where adult males and females have been collected from Apr. 6 to Oct. 15. On July 17, 1953, the author again visited the type locality. No specimens of either sex were located, nor could any trace of eggs be seen. This certainly indicates that the presence of these parasites is definitely cyclic and periodic.

Another series of specimens was collected under interesting conditions at Luther Pass, Calif., on July 24, 1955, by J. C. Downey and the author. Both pupae and larvae were collected underneath cow dung along the marshy margins of Grass Lake. The *Pardosa* species apparently seeks a protected and somewhat dry place just prior to molting, and in this meadow marsh cow dung (especially older pieces) was used for this purpose. Most often the molting spot can be detected by the presence of the thin protective spider web, and almost all of these were found in or near the old scarab or histerid beetle holes in the cow dung. These afforded considerable protection to the spiders. On several occasions two or three larvae or pupae of *O. adaptatus* were found under a single piece of dung, and perhaps 20 percent of the pieces examined contained some example of the parasite. Although several adult males were collected, no egg sites were located, probably because it was just the beginning of the emergence period in this area.

This species was reported by Bechtel and Schlinger (1957) (*Ogcodes* "species #2") as having been stored as prey by a crabronid wasp in San Bernardino Co., Calif.

Ogcodes (*Ogcodes*) *hennigi*, new species

PLATE FIGURES 45, 80, 100

Species of group v.

MALE: Length of entire specimen 4.50 mm., wing length 3.75 mm., as described for *adaptatus*, new species, except as follows:

Head with brown eyes.

Thorax with upper margin of postalar callus light brown; r-m crossvein present but not distinct; venation about as in plate 3, figure 11; squama with whitish margin.

Abdomen with posterior white tergal fasciae covering about one-third of segments III–V, narrower on I and II; dorsal pile about as long as tarsal claw, sparse, not appressed; venter mostly white, including one-half of sternite II and most of I.

Genitalia brown; aedeagus as in plate 8, figure 45; ejaculatory apodeme as in plate 11, figure 80, and plate 13, figure 100.

FEMALE: Unknown.

HOLOTYPE: Male, Orient, Long Island, New York, June 14, 1954 (Roy Latham, USNM 64442).

REMARKS: This rather unique species is apparently connected with the European species *gibbosus* and *varius*, and although it is not phylogenetically related to any Nearctic species, it superficially resembles *adaptatus;* hence, the reference to the latter species in the above description. The aedeagus (pl. 8, fig. 45) of *hennigi* is distinct from all known species, but the ejaculatory apodeme, particularly the ventrally incomplete basal cell, points to a Holarctic connection (compare pl. 13, figs. 100 and 109 of *varius*), as well as other possibly related species with a similar development (see pl. 13, figs. 99, 101, 108, 112).

This species is named for Dr. Willi Hennig, who has been of great assistance to me in this and other acrocerid projects.

Ogcodes (*Ogcodes*) *boharti*, new species

PLATE FIGURES 42, 104

Ogcodes pallidipennis (western subspecies ?), Sabrosky, in part, Amer. Mid. Nat., vol. 39, pp. 417–418, 1948 (not Loew, 1865).

Species of group v.

MALE: Length of entire specimen 5.5 mm., wing length 4.75 mm.

Head reddish brown except black ocellar tubercle and grayish black occiput and frons.

Thorax black except for light brown anterior angles of metanotum, and dark brown posterior tip of humerus, pleura below (light brown above), and large white interpleural area; most of thorax covered with short, nearly erect, yellowish white pile, a little longer on pro-

pleura; legs dark brown, only apical three-fourths of femora and knees lighter brown; wing brownish hyaline, vein M_1 and crossvein r-m present, m-cu crossvein absent, vein M_1 a little longer than R_{4+5}, veins M_2 and M_4 dark brown but other M veins light brown (about as in pl. 3, fig. 11); squama quite infuscated, semitransparent, margin darker brown, halter knob dark brown, stem light brown.

Abdomen with typical *Ogcodes* pattern as in plate 5, figure 29, tergites dark brown, nearly black, the brownish white posterior fasciae occupying about one-fifth of each segment, dorsum covered with sparse, short white pile; sternites I–II dark brown, III–VI mostly brownish white, the anterior one-fourth of III–VI darker brown.

Genitalia dark brown; aedeagus as in plate 7, figure 42; ejaculatory apodeme as in plate 13, figure 104.

FEMALE: Unknown.

HOLOTYPE: Male, Oak Creek Canyon, Arizona, elevation 4,000–5,000 feet, June 11, 1940 (G. E. Bohart, CAS).

PARATOPOTYPES: 1♂ (G. E. Bohart, UCLA); 9♂, June 8, 1940, "collected from *Crabro* nest" (G. E. Bohart, GEB, USNM, EIS).

PARATYPE: 1♂, Huachuca Mts., Arizona, Aug. 24, 1934 (USNM).

PARATYPE VARIATION: Head reddish brown to dark brown; upper margin of postalar callus ranging to light brown, narrowly white in one male; posterior margin of humerus sometimes light brown; parts of femora and tibiae occasionally light to medium brown, when light brown the color contrasts sharply with the dark brown coxae; squama hyaline to nearly opaque, light to dark brown throughout, halter light to dark brown, the stem usually darker than in holotype; genitalia with no appreciable differences.

REMARKS: Though not strikingly different in color from *adaptatus, pallidipennis*, or *sabroskyi, boharti* differs mainly in having the wing membrane evenly brownish hyaline and by the male genitalic structures. In some respects the ejaculatory apodeme resembles that of *gibbosus*, but other features do not indicate a very close relationship. The closest relative of *boharti* is probably *adaptatus*, the two differing primarily in the general coloration, wing infuscation, and the structure of the male genitalia.

The 9 male paratopotypes were recorded by Sabrosky (1948) as "west subsp. of *pallidipennis*." Bechtel and Schlinger (1957), in their summary of acrocerid-crabronid relationships, referred to this species as *Ogcodes* "species #1," and it seems quite probable, on the basis of available evidence, that the crabronid wasp involved was a species of the genus *Ectemnius* rather than *Crabro*.

This species is named for George E. Bohart, the collector, who offered me not only his large personal collection for study but also some valuable information concerning the family Acroceridae.

Ogcodes (*Ogcodes*) *canadensis*, new species

Plate figures 49, 105

Species of group v.

Male: Length of entire specimen (head missing) 3.40 mm., wing length 3.88 mm.

Thorax entirely shining black, covered with short yellowish white pile; legs black, except for brown fore and mid tibiae, even light brown along inner margin, fore and mid tarsi somewhat browned, pulvilli grayish black; wing hyaline, only costal veins dark brown, vein M_1 present but faint, r-m crossvein present but short and faint, m-cu crossvein absent, vein M_2 short and pale, vein M_4 truly veinlike only after bend near r-m crossvein (venation about as in fig. 11); squama opaque white except for large dark brown basal spot which is more transparent than rest of squama, squamal margin dark brown, halter black, stem white.

Abdomen black, covered with short, sparse, white pile, tergites ii–vi with narrow yellowish white posterior fasciae, each occupying about one-sixth of each tergite, tergite i black; sternites ii–vi brownish black with fasciae as on tergites but slightly wider, sternite i entirely brownish black.

Genitalia dark brown; aedeagus as in plate 8, figure 49; ejaculatory apodeme as in plate 13, figure 105.

Female: Unknown.

Holotype: Male, Houghron, Ontario, Canada, July 26, 1951, Forest Insect Survey, No. 051–1406 (CNM).

Paratype: 1 ♂, Ottawa, Canada, July 26, 1942 (A. Brooks, CNM).

Remarks: Although *canadensis* possesses characters that are intermediate between *boharti* and *sabroskyi*, it appears to be closely related only to the latter (see text fig. 2). The features of the aedeagus and the dark basal squamal spot easily separate *canadensis* from all other Nearctic *Ogcodes* species. The paratype male of this melanic species agrees essentially with the holotype, but the abdominal fasciae are nearly white, and the squamal spot is slightly less infuscated.

Ogcodes (*Ogcodes*) *sabroskyi*, new species

Plate figures 44, 107

Species of group v.

Male: Length of entire specimen 3.30 mm., wing length 2.90 mm.

Head reddish brown, occiput black, narrow, flattened behind.

Thorax covered with very short golden appressed pile, that on scutellum somewhat longer and less appressed, black except for dark brown anterior angle of metanotum, and blackish brown over most of plura with several large white interpleural areas above; pile of pro-

pleuron longer and more erect than on mesonotum; legs black except that basal three-fourths of tibiae are light brown; wing hyaline, vein M_1 present but weak, longer than R_{4+5}, crossvein r-m pale, nearly reaching bend in vein M_4, vein M_2 present but quite pale, m-cu crossvein absent (venation about as in pl. 3, fig. 11); squama semitransparent, slightly browned throughout, margin dark brown, halter knob brown.

Abdomen dark brown, rather narrow, with typical *Ogcodes* pattern (pl. 5, fig. 29) except that posterior tergal fasciae are of nearly even length throughout and occupy only one-sixth of each tergite, entire dorsum covered with sparse, short, golden, slightly appressed pile; sternites dark brown except for whitish brown in median area of II, sternites III–VI mostly whitish brown but of same pattern as II.

Genitalia dark brown, quite small; aedeagus as in plate 8, figure 44; ejaculatory apodeme as in plate 13, figure 107.

FEMALE: Unknown.

HOLOTYPE: Male, Currahee Mt., Stephens Co., Georgia, July 23, 1952 (H. R. Dodge, USNM 61729).

PARATOPOTYPE: 1 ♂ (CAS).

PARATYPE: 1 ♂, Kennesaw Mt., Cobb Co., Georgia, June 15, 1952 (Dodge, Sudia, Seago, EIS).

According to information received from H. Dodge in a letter (1953), "the flies were taken from the hand rail of the observation tower on the top of Currahee Mountain, and though quite sluggish, were not easily taken by net." He also said several more specimens were seen but could not be caught. To my knowledge, specimens of *Ogcodes* have been collected nearly everywhere except on mountain tops. The only other record of this sort was cited by Brunetti (1920, p. 171) for *Ogcodes angustimarginatus* Brunetti in Ceylon. His specimen was likewise a male, and it may be that further collecting on mountain tops would yield some good records of this and other genera of Acroceridae.

REMARKS: *O. sabroskyi* has affinities with *adaptatus*, *boharti*, *canadensis* and *pallidipennis*, though in its distribution it approaches only the last-named species. It is believed to be the most highly evolved species of the *pallidipennis* group in the Nearctic subregion, and most closely related to *canadensis* (see text fig. 2). The following combination of characters will separate *sabroskyi* from other *Ogcodes* species: the narrow posterior tergal fasciae, golden pile, narrow abdomen, and structure of male genitalia. The aedeagus of *sabroskyi* resembles that of the Palaearctic *gibbosus*, but this apparently is a case of convergence, as other morphological features are quite distinct.

It is a pleasure to name this species after Mr. Curtis W. Sabrosky, whose recent studies on the family Acroceridae have contributed much

to the understanding and clarification of this group, and who has so generously given me help on this and other projects now in progress.

Ogcodes species

Several specimens examined could not be placed with any degree of certainty. It is possible that they represent new species or subspecies, or that they are merely variations of known species whose limits have not yet been determined.

(1) *Ogcodes* species similar to *adaptatus* but differing mainly in the very small size and in having the aedeagus somewhat depressed apically.

California: 3 ♂, 2 ♀, Mill Valley, Marin Co., July 6, 1924 (E. P. Van Duzee), Sept. 11, 1949 and June 27, 1950 (E. S. Ross), June 12, 1950, in cheesecloth trap, and June 30, 1950 (H. B. Leech, all in CAS); 1 ♂, Fallen Leaf Lake, Lake Tahoe, El Dorado Co., Aug. 1931 (O. H. Swezey), and 1 ♀, same data, July 14, 1915 (E. C. Van Dyke, both in CAS); 1 ♂, "Idlewild" (probably Idyllwild), July 5, 1928 (E. C. Van Dyke, CAS). Some of the above specimens were recorded by Sabrosky (1948) as "west. subsp. of *pallidipennis*."

(2) *Ogcodes* species near *boharti*, *pallidipennis*, and *adaptatus*. There are four specimens which seem to differ sufficiently from the above-named species (mostly by coloration, and when males, by the genitalia) that their identity is questioned.

Arizona: 1 ♀, White Mts., June 19, 1950 (P. P. Cook, UK); 1 ♂, Oak Creek Canyon, July 9, 1941 (R. H. Beamer, UK) [this is definitely not *boharti*]; 1 ♂, Sunnyside Canyon, Huachuca Mts., July 9, 1940 (E. E. Kenaga, UK).

New Mexico: 1 ♂, Ruidosa, June 26, 1940 (R. H. Beamer, UK). The last three specimens listed were recorded by Sabrosky (1948) as "west. subsp. of *pallidipennis*."

(3) *Ogcodes* species, probably *borealis* or *eugonatus* (wings broken off).

Wisconsin: 1 ♀, University Arboretum, July 1, 1946 (J. R. D., UW).

Ogcodes (*Neogcodes*), new subgenus

Type species: *Oncodes albiventris* Johnson, by present designation.

Diagnosis: Differs from subgenus *Ogcodes* as follows: Antennal segment III short, not more than three times longer than broad, its apex beset with five or six long setae, each about one-half as long (male) or as long as segment III (female) as shown in plate 5, figure 23; antennal sensory pit large. Proboscis minute but visible, not covered by membrane in dead specimen, rather shining. Wing venation as in plate 4, figure 17.

Discussion: At the present time only the Nearctic *albiventris* can be placed in this subgenus; however, it seems likely that more may be included when other little-known species can be carefully studied.

This subgenus apparently represents the most highly evolved form of the subfamily Acrocerinae, and was evolved from species of the *colei* group of the subgenus *Ogcodes*, appearing to be most closely related to the uncommon *vittisternum* (see text fig. 2).

The antennae of subgenus *Neogcodes* show a definite resemblance to certain species of *Pterodontia* Gray, but this similarity is no doubt due to convergence rather than to any direct inherited development.

Ogcodes (*Neogcodes*) *albiventris* (Johnson)

PLATE FIGURES 17, 23, 30, 65, 92

Oncodes albiventris Johnson, Psyche, vol. 11, p. 18, 1904.

Ogcodes albiventris, Cole, Trans. Amer. Ent. Soc., vol. 45, p. 67, 1919; Psyche, vol. 30, p. 47, 1923.—Sabrosky, Amer. Mid. Nat., vol. 31, p. 390, 1944; Amer. Mid. Nat., vol. 39, p. 423, pl. 1, figs. 8–9, 1948.

DIAGNOSIS: MALE: Antenna light brown, segment III not much longer than I and II (pl. 5, fig. 23); head, thorax, coxae, trochanters, basal one-third to one-fourth of femora, apex of last tarsal segment, claws, halter knob and small spots on abdomen, black; abdomen white, marked more or less as in plate 5, figure 30; dorsum covered with long, dense, whitish yellow pile, about as long as hind metatarsus; wing venation weak, vein M_1, r-m and m-cu crossveins absent (pl. 4, fig. 17); aedeagus as in plate 10, figure 65; ejaculatory apodeme as in plate 12, figure 92.

FEMALE: Same as described for male except as follows: antennal segment III about one-third shorter than in male; abdomen almost entirely black, patterned about as in plate 5, figure 29, but white fasciae extremely narrow, those on sternites slightly wider; abdominal pile not quite as long as in male, and much less dense; cerci light brown; legs mostly light brown, only coxae, trochanters and apices of tarsi with some black, knees white.

HOLOTYPE: 1 ♂, Toronto, Ontario, Canada, July 18, 1896 (MCZ).

DISTRIBUTION: Until the present, this species has been known from only the holotype male from Canada and another male from Livermore, Calif. (recorded by Cole, 1923, later studied by Sabrosky, 1948). The examination of five more specimens, including the first female, has shown that *albiventris* ranges widely throughout northern United States and southern Canada, yet individuals of the species remain quite rare.

NEW DISTRIBUTION RECORDS: (5 specimens.)

BRITISH COLUMBIA: 1 ♂, Robson, Waldies Rd., June 29, 1947 (H. R. Foxlee, CNM).

CALIFORNIA: 1 ♀, Topaz Lake, Mono Co., June 26, 1957 (A. E. Pritchard, CIS); 1 ♂, Palo Alto, July 22, 1892 (CM).

MICHIGAN: 2 ♂, Muskegon, July 4, 1906 (C. A. Hill, CAS, EIS).

Discussion: The male of *albiventris* is distinguished from all other New World species of *Ogcodes* by the strikingly patterned abdomen; however, the female (aside from subgeneric features) is hardly differentiated from a number of species, particularly those of the *colei* group. The closest relative of *albiventris* is no doubt *vittisternum*, but *colei*, *shewelli*, and *floridensis* are also related.

Ogcodes species of Neotropical region

There are now nine species known to occur in this region. Two of these, *dispar* (Macquart) and *pallidipennis* Loew, are primarily Nearctic in distribution and reach into this region only as far south as Costa Rica. Four of the species are found in Chile and its islands, i.e., *chilensis* Sabrosky, *kuscheli* Sabrosky, *porteri* Schlinger, and *triangularis* Sabrosky. The three remaining species are herein described as new and are known only from their respective type localities. These are *argentinensis*, new species; *brasilensis*, new species; and *colombiensis*, new species.

At least four species groups are found in this region, and it seems very probable that more will be uncovered when future collecting permits, since the first species of *Ogcodes* was only recently described from this region by Sabrosky (1945).

Ogcodes (Ogcodes) colombiensis, new species

Plate figures 40, 108

Species of group v.

Male: Length of entire specimen 5.30 mm., wing length 4.55 mm. Head reddish brown, occiput black and narrow; antenna with one seta on apex of style.

Thorax with only central part of mesonotum black, remainder brown, that of humerus and parts of pleura light brown, whole thorax covered with short light brown pile; legs mostly light brown, hind femur and tibia infuscated, the apices of tarsi nearly black as are pulvilli; wing evenly infuscated light brown, costal area somewhat darker, vein M_1 distinct, longer than R_{4+5}, reaching to margin of wing, r-m crossvein present but short, vein M_2 present and distinct, all veins dark brown; squama opaque, yellowish brown, margin darker, entirely covered with white pile; halter brown, its stem somewhat paler.

Abdomen with tergites i–vi mostly brownish black with yellowish white posterior fasciae as in plate 5, figure 29, tergites ii–iv each with submedian light brown oval spot, somewhat as in *guttatus*, though not as prominent; sternites white except that each one has a narrow anterior blackish brown fascia; dorsum entirely covered with very short, light brown pile.

Genitalia dark brown; aedeagus as in plate 7, figure 40; ejaculatory apodeme as in plate 13, figure 108.

FEMALE: Unknown.

HOLOTYPE: Male, 1 mile west of Villeta, Cundinamarca, Colombia, Mar. 8, 1955, elevation 860 meters, on top of rock pile (E. I. Schlinger, CAS).

REMARKS: Although the author spent seven months in Peru, Colombia, and Ecuador during 1954–1955, this male was the only *Ogcodes* specimen taken. This is one of the three species now known from this region outside of Chile and is therefore of especial interest from the standpoint of distribution.

The Nearctic species *dispar*, which ranges as far south as Costa Rica, is probably the nearest relative of *colombiensis*. On the basis of color, the latter species is similar to *chilensis*, which, however, is a member of the *eugonatus* group and therefore not closely related. *O. brasilensis*, which superficially resembles *colombiensis*, is actually quite different in the structure of the male genitalia and is apparently only related geographically. In the same way, *argentinensis* is more closely connected with Nearctic species than with *colombiensis*.

Ogcodes (*Ogcodes*) *brasilensis*, new species

PLATE FIGURES 50, 106

Species of group v.

MALE: Length of entire specimen 6.60 mm., wing length 5.30 mm.

Head dark brown except for black occiput and light brown antenna; antenna with rather long, thin style which has one apical seta.

Thorax light brown except for reddish brown on three longitudinal vittae (median vitta present only for anterior three-fourths, lateral vitta present from wing base to postalar callus), lateral margins of scutellum, basal one-half of metanotum, spot on propleura, spot in front of prothoracic pleura and spot on tegula; metanotum plainly visible as abdomen is not highly arched anteriorly; notum entirely covered with short golden brown pile; legs mostly light brown except for dark brown anterior spot on mid and hind coxae, tarsal apices, claws and pulvilli; hind femur and tibia swollen apically and of nearly equal length; wing heavily infuscated throughout, veins strong and dark brown; vein M_1 present and reaching wing margin, r-m crossvein present only as an infuscated line, not a true vein, vein M_2 strong only distally where it reaches wing margin, m-cu crossvein absent, anal vein weak but nearly approaching Cu_2 at wing margin, anal axillary vein strong, arclike; squama nearly opaque, evenly dark brown, halter knob dark brown, its stem yellow.

Abdomen quite long and narrow, about two times longer than wide, rather evenly light brown with narrow whitish brown posterior tergal

fasciae with very narrow dark brown fasciae immediately preceding each fascia on tergites II–V; sternites light brown except for white posterior fasciae on II–V and dark brown anterior fasciae on II–IV; sternite VI is long and rather broadly overlapping tergite VI at lateral margin; both dorsum and venter covered with short brown pile.

Genitalia light and dark brown; aedeagus as in plate 8, figure 50, ejaculatory apodeme as in plate 5, figure 106.

Female: Unknown.

Holotype: Male, Nova Teutonia, "27° 11′ B. 52° 23′ L.," Brazil, Apr. 22 (?), 1938 (Fritz Plaumann, BMNH 1939–66).

Remarks: This is the first record of the genus for Brazil, and one of the seven species now known to occur in South America. It has no known close relative.

Ogcodes (Ogcodes) argentinensis, new species

Plate figures 39, 103

Species of group V.

Male: Length of entire specimen 3.50 mm., wing length 3.00 mm., as described for *adaptatus*, new species, except as follows:

Head with brown eyes, antenna light brown.

Thorax black except for brown mesopleural area, covered with short brown pile; legs dark brown except tibiae light brown and tips of tarsi black; wing venation about as in plate 3, figure 11, but M_1 and M_2 faint, r-m crossvein absent; squama opaque brown, halter stem light brown, knob dark brown.

Abdomen with posterior white tergal fasciae somewhat enlarged medially, dorsum covered with sparse, short, nonappressed brown pile, somewhat longer medially; sternites as in *adaptatus* except brown and white instead of black and white.

Genitalia brown; aedeagus as in plate 7, figure 39; ejaculatory apodeme as in plate 13, figure 103.

Female: As described for *adaptatus* except as follows: legs mostly dark brown; parts of pleurae light brown; postalar callus, metanotum and apical margin of scutellum dark brown; abdomen dark brown with narrower posterior white tergal fasciae.

Holotype: Male, Chascomus, Buenos Aires, Argentina, Feb. 6, 1954 (Ibarra Grossa, USNM 64443).

Paratopotypes: 2 ♂, 1 ♀ (EIS).

Remarks: This is the first record of an *Ogcodes* species from Argentina. Although there are now nine species of this genus known from the Neotropical region, none of those described is apparently closely related to *argentinensis*, with the possible exception of *colombiensis*. It appears that the Nearctic *adaptatus* and *boharti* are most closely

related to *argentinensis*, but are easily distinguished by color patterns, the absence of r-m crossvein, and structure of the male genitalia.

One of the male paratypes measured only 2.5 mm. in length, being one of the smallest *Ogcodes* specimens I have examined. There was no significant difference noted in the paratype males examined.

Ogcodes (*Ogcodes*) *chilensis* Sabrosky

Ogcodes chilensis Sabrosky, Rev. Chil. Hist. Nat. (1944), vol. 48, p. 318, 1945.

Species of group II.

Types: Holotype ♂, Chile (ex collection of Vicuña), also a paratype ♂, Panguipulli, Chile (A. Hollermayer) both in the collection of Carlos Stuardo in Santiago, Chile.

Discussion: I have not seen this species, but from the description and from notes on the holotype furnished by Prof. Carlos Stuardo, I feel quite sure it is a member of the *eugonatus* group. Its black to reddish black thorax and the yellow or orange spots on the foremargin of the mesonotum distinguish it from others of the region.

Ogcodes (*Ogcodes*) *triangularis* Sabrosky

Ogcodes triangularis Sabrosky, Rev. Chil. Hist. Nat. (1944), vol. 48, p. 317, fig. 1, 1945.

Type: Holotype ♂, Malloco, Chile, Apr. 1, 1935 (C. Stuardo, CS).

Discussion: Species of group IV (?). Even though this species is known only from the holotype, it is quite distinct from the other Neotropical forms as noted in the key to species above. It is apparently closely related to *kuscheli*. Sabrosky noted that in color pattern it resembled certain *Acrocera* species, and in this feature it also approaches *O. porteri*.

Not having seen the holotype, I am unable at present to place this species in a group. However, judging from its apparent relationship to *kuscheli*, I have placed it tentatively in the *colei* group. The absence of vein M_1, however, suggests the *eugonatus* group, while the rather distinct color markings might relate it to the *porteri* group or to another closely related but unrecognized group. An examination of the male genitalia will no doubt quickly place this species in its proper group.

Ogcodes (*Ogcodes*) *kuscheli* Sabrosky

Plate figures 9, 59, 86

Ogcodes kuscheli Sabrosky, Rev. Chil. Ent., vol. 1, p. 189, 1951.

Types: Holotype ♂, allotype ♀, and 4 ♂, 1 ♀ paratypes, from Masatierra Island, Juan Fernandez Islands, Chile (P. G. Kuschel). (Holotype, allotype and 2 ♂ paratypes, Universidad de Chile collection in Santiago; 2 ♂, 1 ♀ paratypes, USNM.)

Discussion: Species of group iv. According to Sabrosky it is closely related to *triangularis*, and although vein M_1 is absent (except distally), the general wing venation is quite strong; r-m crossvein is complete, R_{4+5} is nearly complete and sinuous, vein M_2 is virtually complete, and the basal portion of the media and a two-branched cubitus are present.

The female of *kuscheli* is quite distinct from the male in coloration, the female having the thorax predominantly golden yellow with three black stripes, while the male thorax is all black.

Ogcodes (*Ogcodes*) *porteri* Schlinger

Plate figure 16

Ogcodes porteri Schlinger, Wasmann Journ. Biol., vol. 11, p. 319, figs. 1, 2, 1953.

Type: Holotype ♂, Viña del Mar, Chile, 1910 (Porter, INHM).

Discussion: Species of group vi. This species, which is known only from the holotype, is apparently one of the most highly evolved *Ogcodes*, judging from its simplified wing venation with veins M_1, M_2 and M_4 absent, and its extremely narrow anal area (pl. 4, fig. 16). It also has a very large head which is nearly as broad as the thorax, and a rather large ocellar triangle. The general color pattern is similar to that of certain species of the genus *Acrocera*.

Ogcodes species

A single female specimen of an apparently undescribed species was examined from 50 km. east of San Carlos, Nuble, Chile, Dec. 26, 1950 (Ross and Michelbacher, CAS). It is definitely a member of the *pallidipennis* group. This is the first representative of the group from Chile and shows that the group apparently is spread throughout the Neotropical region. The thorax is entirely dark brown and the tergal and sternal fasciae are white on a dark brown ground color, features typical of females of the *pallidipennis* group. This may be a female of *argentinensis*, but males will have to be examined from Chile to be sure.

Acrocerid Taxa and List of Ogcodes Species

Each entry is followed by the author of the taxon, the date of original publication, the next higher taxon (in parentheses), the referable taxon in case of a synonym, and page reference to the text with the most important page in italics. Synonyms are in italics.

Hosts and Predators of Ogcodes

(The species name is followed by the generic name, in parentheses)

	Host	*Predator*	*Both host and predator*
Aelurillus, p. 239	X		
Agelenidae, pp. 238, 242	X		
Amaurobidae, p. 238	X		
Anyphaenella, pp. 239, 283	X		
Anyphaenidae, p. 238	X		
Aranaea, p. 238			X
banksi (Pardosa), pp. 239, 278	X		
barbipes (Tarentula), p. 239	X		
bitaeniata (Cosmophasis), p. 239	X		
Clubiona, p. 239	X		
Clubionidae, p. 238	X		
Cosmophasis, p. 239	X		
Crabro, pp. 269, 277, 306		X	
cunctator (Xysticus), pp. 239, 281, 302	X		
curta (Hololena), pp. 239, 292	X		
Dictyna, p. 243		X	
distincta (Pardosa), pp. 239, 278	X		
Ectemnius, pp. 243, 279, 306		X	
fasciata (Phlegra), p. 239	X		
ferus (Nabis), p. 243		X	
Gnaphosidae, p. 238	X		
Heliophanus, p. 239	X		
Herphyllus, pp. 239, 292	X		
Hololena, pp. 239, 292, 302	X		
insignitus (Aelurillus), p. 239	X		
kochi (Tarentula), p. 239, 281	X		
Labidognatha, p. 242			X
luctuosus (Xysticus), p. 239	X		
Lycosa, pp. 239, 291	X		
Lycosidae, pp. 238, 241, 242			X
Matachia, pp. 239, 257	X		
montanensis (Xysticus), pp. 239, 283, 291	X		
Nabis, p. 243		X	
Orthognatha, p. 242	X		
palomara (Steatoda), pp. 239, 291	X		
Pardosa, pp. 239, 243, 278, 291, 301, 302, 304			X
Philodromus, pp. 239, 302	X		
Phlegra, p. 239	X		
Prothesima, p. 239	X		
Psechridae, p. 238	X		
Pteromalidae, p. 243		X	
pullata (Lycosa), p. 239	X		
putris (Clubiona), p. 239	X		
ramulicola (Matachia), pp. 239, 257	X		
raphidid, p. 243		X	
reduviid, p. 243		X	
saltabunda (Anyphaenella), pp. 239, 283	X		
Salticidae, p. 238	X		
saxatilis (Pardosa), pp. 239, 291	X		
spiniferus (Ectemnius), p. 279		X	
Steatoda, pp. 239, 291	X		
sternalis (Pardosa), pp. 239, 278, 301, 302, 304	X		
Tarentula, pp. 239, 281	X		
Tetragnatha, p. 243		X	
Theridiidae, p. 238	X		
Thomosidae, p. 238			X
Trochosa, p. 239	X		
Walmus, pp. 239, 291	X		
Xysticus, pp. 239, 243, 281, 283, 291, 302			X
Zelotes, p. 239	X		

Appendix

It is unfortunate that I was unable to include in this revision the recent work on the Australian Acroceridae by Paramonov (1957). I was, however, able to include his new species in the list of world species on page 316, although I did not include his synonymical findings. A brief review of his work follows.

Paramonov recognized 4 genera, 29 species, and 1 variety of Australian acrocerids. Of these, 11 species and 1 variety were described as new. The genus *Ogcodes* (as *Oncodes*) comprised more than one-half of the article and included a key which distinguished 18 of the 22 recognized species. Altogether, 10 new species of *Ogcodes* were described: *armstrongi* (♀) *waterhousei* (♀), *wilsoni* (♂), *deserticola* (♂), *pusillus* (♂), *tenuipes* (♂), *hirtifrons* (♂♀), *canberranus* (♂), *glomerosus* (♂) and *lucidus* (♂). Judging from Paramonov's descriptions it seems probable that these new species belong to the following species groups as set forth earlier in my revision. In the *pallidipennis* group are *armstrongi*, *waterhousei*, *pusillus*, *deserticola*, and *wilsoni*. In the *colei* group are *tenuipes*, *canberranus*, *glomerosus*, and *lucidus*. The other new species, *hirtifrons*, very probably belongs to the new subgenus *Protogcodes*, which was described above from New Zealand. Also on the basis of Paramonov's paper it seems probable that *victoriensis* Brunetti, *insignis* Brunetti, and *variegatus* Brunetti belong in the *pallidipennis* group, and that *tasmanica* Westwood, *ignava* Westwood, *flavescens* White, and *fratellus* Brunetti (all of which Paramonov believed were synonyms of *fortnumi* Westwood) belong in the *colei* group. The positions of *nigrinervis* White, *doddi* Wandolleck, *castaneus* Brunetti, and *fumatus* Froggatt remain unknown.

For the most part Paramonov's descriptions are quite adequate; however, in several instances mention was made of the difficulty in finding structural differences between the species. For example, he described *wilsoni* and *deserticola* (both ♂♂) as new species closely related to *insignis* Brunetti, and stated under the latter (p. 538) that both of them were "extremely closely related to *insignis* and probably belong to it." Although certain color differences were noted, here is a case where an examination of the genitalia would very probably have solved the problem of specificity. Other than color, no mention was made for any species in regard to the male genitalia.

I have been able to examine three of Paramonov's species, all represented by type material: *armstrongi* (♀ only), *deserticola* (♂ only),

and *hirtifrons* (♀ only). *O. armstrongi* was described from three females and is closely related to *basalis* (Walker). However, when color differences show up in the female sex as strikingly as they do in *armstrongi*, chances are that the male sex, when known, will be easily distinguished from *basalis* (Walker). I examined the male genitalia of *deserticola* and although the species shows a relationship to *basalis* (Walker) it is quite distinct. The female specimen of *hirtifrons* that I examined did not have the basal antennal seta characteristic of *O.* (*Protogcodes*) *paramonovi*, new species, but other characteristics seem to agree with the latter; hence, I tentatively place *hirtifrons* in the new subgenus *Protogcodes*.

It is difficult to say whether any species of *Ogcodes* should be described from the female sex alone, particularly since most females of *Ogcodes* species throughout the world are difficult to distinguish, and as of now few structural characters are known that enable one to differentiate females of one species from another. Paramonov's new species *waterhousei*, described from a unique female, may be only a variant of *basalis* (Walker) or *armstrongi*. The main specific character noted for *waterhousei* was its darkened wings, a feature which has been shown to be rather unreliable after large series were examined (see discussion under *adaptatus*, new species (p. 299), and under *pallidipennis* Loew by Sabrosky, 1944).

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Plates 1–13

with

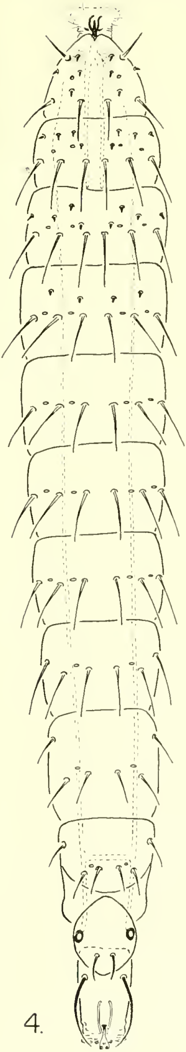
Plate-Figures 1–112

1.

2.

3.

FIGURES 1–3.—*Ogcodes adaptatus*, new species (Luther Pass, Calif.): 1, Pupa attached by head to spider host's premoulting web (below pupa is host skeleton, and at far right is parasite's meconium); 2, teneral adult (2 minutes old) with pupal skin below; 3, adult resting on its pupal skin (note obvious protruding mouthparts). [Photographs by Francis M. Summers.]



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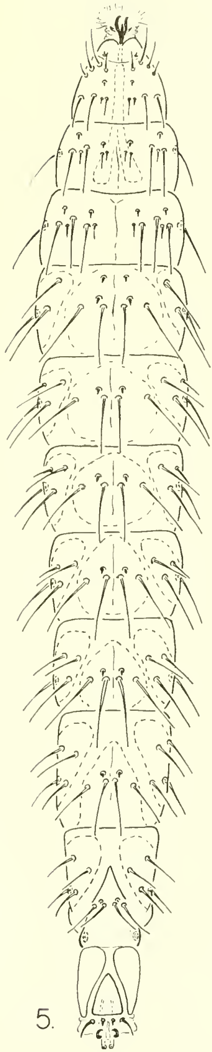
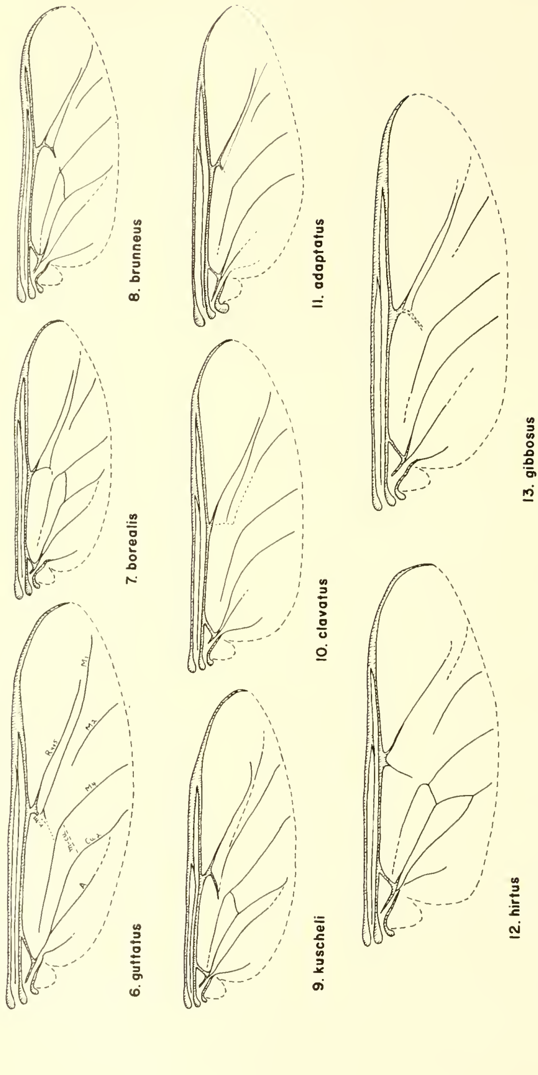
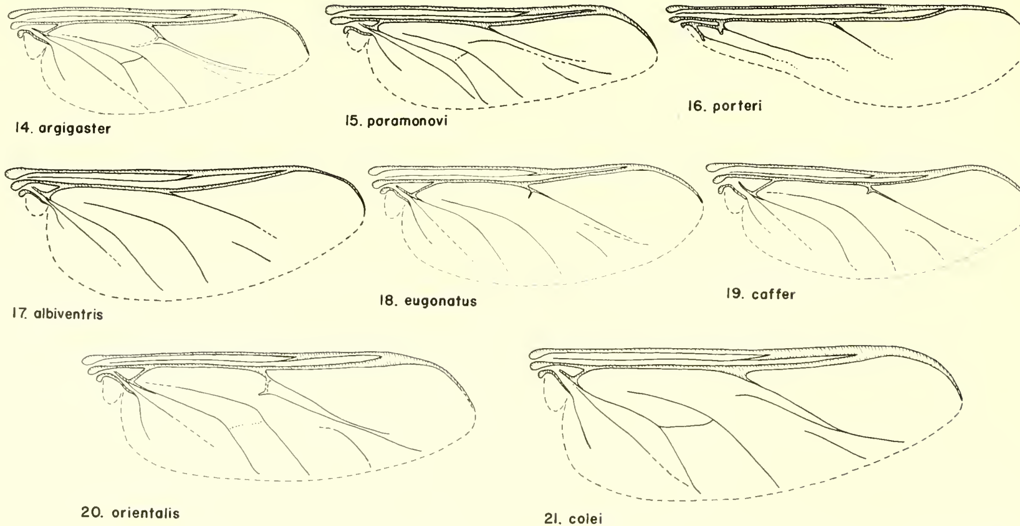


5.

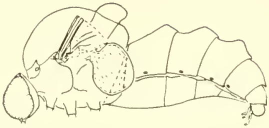
Figures 4–5.—First-instar larvae of *Ogcodes adaptatus*, new species (Sardine Creek, Calif., paratypes): 4, dorsal view; 5, ventral view. (Both larvae with heads at top.)



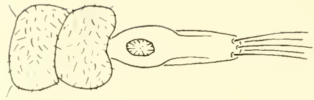
FIGURES 6–13.—Wings of *Ogcodes* species (6, Mt. Pelion, Greece; 7, Waterton Park, Canada; 8, Ohakune, New Zealand; 9, Masatierra, Juan Fernandez Islands, Chile, paratype; 10, Naivisha, Kenya; 11, Sardine Creek, Calif., paratype; 12, Sharaf Khanef, Iran; 13, Uckeritz-Usedom, Germany).



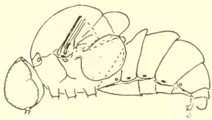
FIGURES 14–21.—Wings of *Ogcodes* species (14, Cass, New Zealand, paratype; 15, Ohakune, New Zealand, holotype; 16, Viña del Mar, Chile, holotype; 17, Muskegon, Mich.; 18, Morongo Valley, Calif.; 19, Milnerton, South Africa; 20, Angkor, Cambodia, holotype; 21, Mill Valley, Calif.).



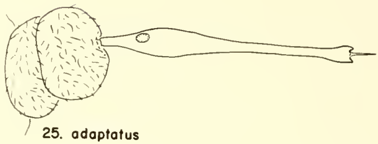
22. guttatus



23. albiventris

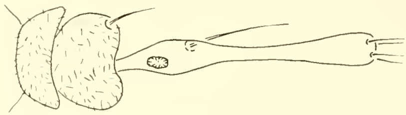


24. adaptatus

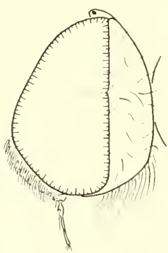


25. adaptatus

26. hirtus

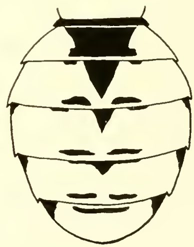


27. paramonavi



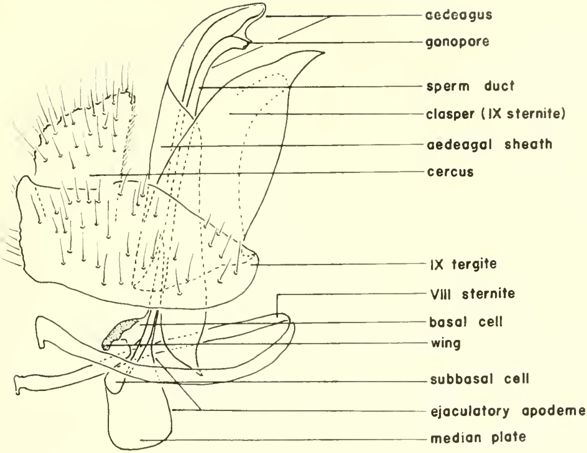
28. paramonovi

29. adaptatus

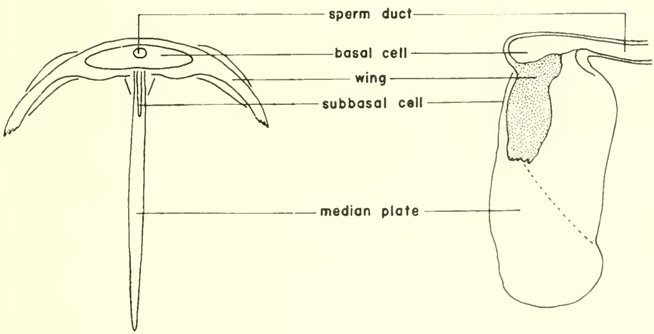


30. albiventris

FIGURES 22–30.—*Ogcodes* species: 22, 24, 26, with bodies in lateral view (22, Mt. Pelion, Greece; 24, Sardine Creek, Calif., paratype; 26, Sharaf Khanef, Iran); 23, *Neogcodes*, new subgenus (Livermore, Calif.); 25, subgenus *Ogcodes* (Sardine Creek, Calif., paratype); 27, *Protogcodes*, new subgenus, with antennae in lateral view (Ohakune, New Zealand, holotype); 28, head in lateral view (same); 29, 30, abdomens in dorsal view (29, Sardine Creek, Calif.; 30, Palo Alto, Calif.).



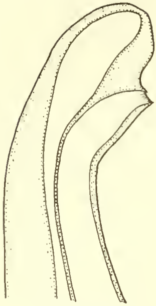
31. hirtus

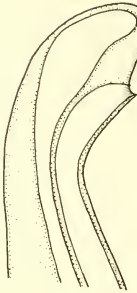


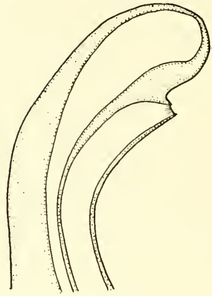
32. adaptatus

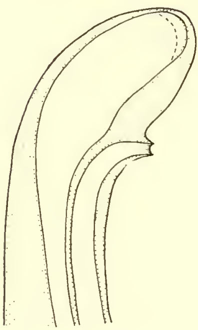
33. dispar

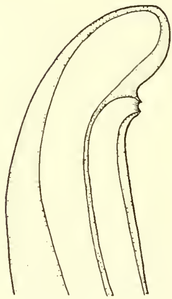
FIGURES 31–33.—Genitalia of *Ogcodes* species: 31, entire genital segments in lateral view, dorsum to the left (Sharaf Khanef, Iran); 32, ejaculatory apodeme in anterior view (Sardine Creek, Calif., paratype); 33, ejaculatory apodeme in lateral view (Du Bois, Ill.).

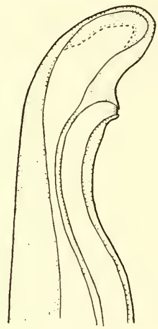

34. rufaabdominalis

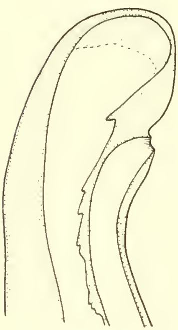

35. dispar


36. pallidipennis

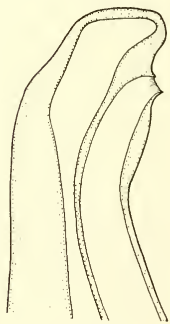

37. philippinensis


38. orientalis

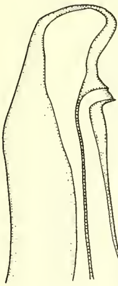

39. argentinensis


40. colombiensis

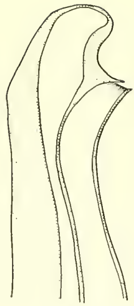

41. adaptatus


42. boharti

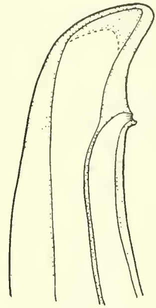
FIGURES 34–42.—*Ogcodes* species, with distal portion of aedeagi in lateral view (34, West Salt Lake, Utah; 35, Du Bois, Ill.; 36, Fond du Lac, Wis.; 37, Sibuyan Island, Philippine Islands, holotype; 38, Angkor, Cambodia, holotype; 39, Chascomus, Buenos Aires, Argentina, holotype; 40, Villeta, Cundinamarca, Colombia, holotype; 41, Sardine Creek, Calif., paratype; 42, Oak Creek Canyon, Ariz., holotype).



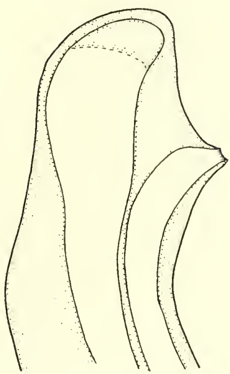
43. gibbosus



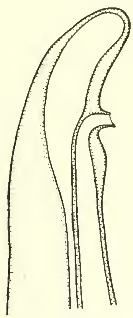
44. sabroskyi



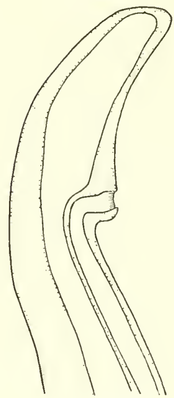
45. hennigi



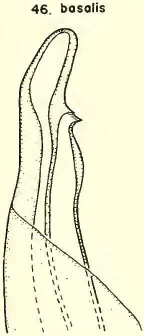
46. basalis



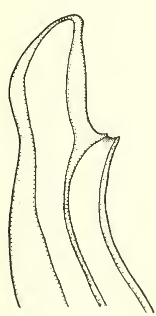
47. varius



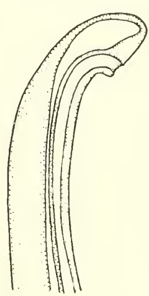
48. clavatus



49. canadensis

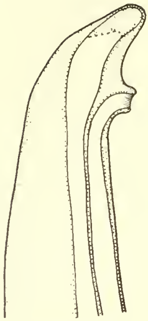


50. brasilensis

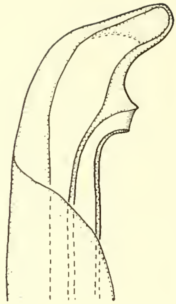


51. pallipes

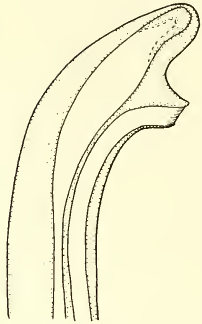
FIGURES 43–51.—*Ogcodes* species, with distal portion of aedeagi in lateral view (43, Potsdam, Germany; 44, Currahee Mountain, Ga., holotype; 45, Orient, N.Y., holotype; 46, Acacia Plateau, New South Wales, Australia; 47, Berlin, Germany; 48, Naivisha, Kenya; 49, Houghron, Ontario, Canada, holotype; 50, Nova Teutonia, Brazil, holotype; 51, Eyr's, Germany).



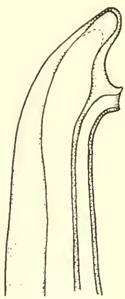
52. nitens



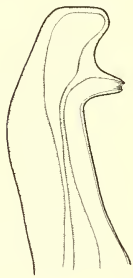
53. argigaster



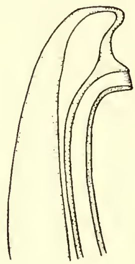
54. hirtus



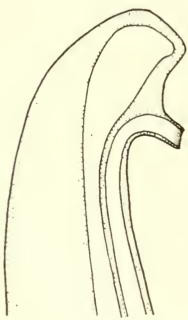
55. similis



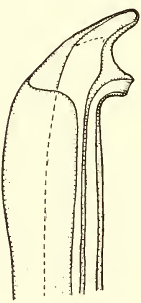
56. borealis



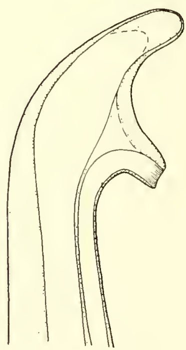
57. fortnumi



58. pygmaeus

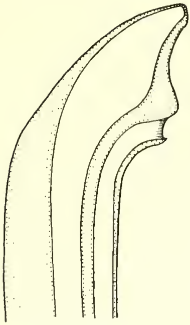


59. kuscheli

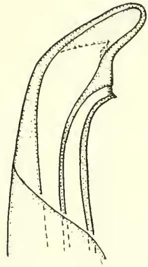


60. paramonovi

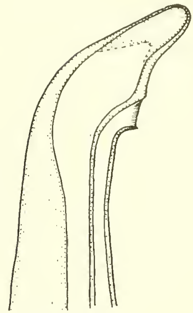
FIGURES 52–60.—*Ogcodes* species, with distal portion of aedeagi in lateral view (52, Port-hills, New Zealand; 53, Cass, New Zealand, holotype; 54, Sharaf Khanef, Iran; 55, New Zealand, holotype; 56, Drews Gap, Oreg.; 57, 58, Upper Blessington, Tasmania; 59, Masatierra, Juan Fernandez Islands, Chile, paratype; 60, Ohakune, New Zealand, holotype).



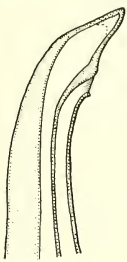
61. leptisoma



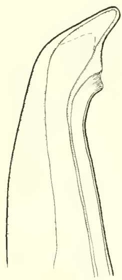
62. shewelli



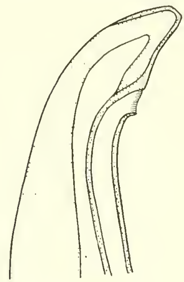
63. vittisternum



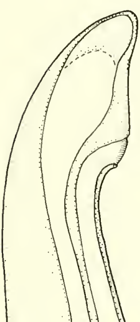
64. colei



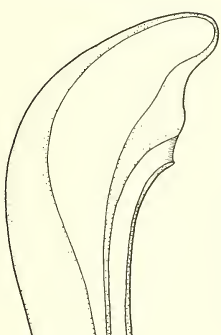
65. albiventris



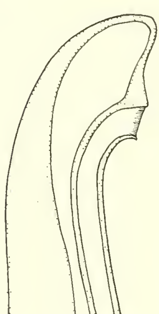
66. guttatus



67. consimilis

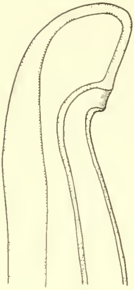


68. brunneus

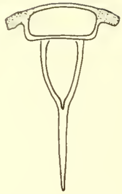


69. caffer

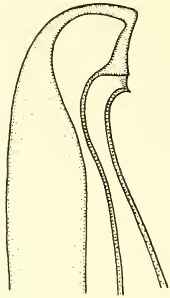
FIGURES 61–69.—*Ogcodes* species, with distal portion of aedeagi in lateral view (61, Queenstown, New Zealand, holotype; 62, Cold Springs Harbor, N.Y.; 63, Spokane, Wash.; 64 Clear Lake, Calif.; 65, Muskegon, Mich.; 66, Mount Pelion, Greece; 67, Blackhall, New Zealand; 68, Ohakune, New Zealand; 69, Matjesfontein, Cape Province, South Africa).



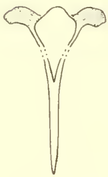
71. zonatus



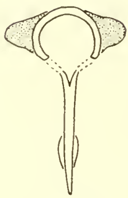
72. borealis



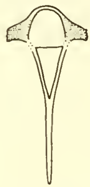
73. eugonatus



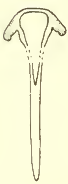
74. fortnumi



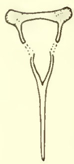
75. consimilis



76. pallipes

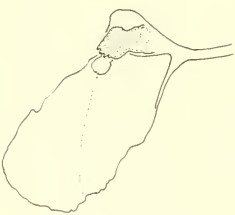


77. pygmaeus

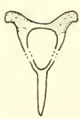


78. eugonotus

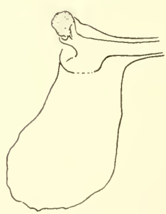
79. nitens



80. hennigi

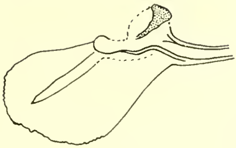


81. guttatus

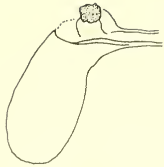


82. brunneus

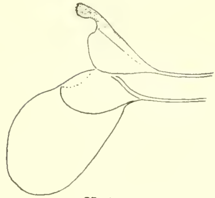
FIGURES 71–82.—Genitalia of *Ogcodes* species: 71, 73, with aedeagi in lateral view (71, St. Moritz, Switzerland; 73, Morongo Valley, Calif.); 72, 74–79, 81, with ejaculatory apodemes in anterior view (72, Dane Co., Wis.; 74, 77, Upper Blessington, Tasmania; 75, Ohakune, New Zealand; 76, Maran's, France; 78, Mill Creek, San Bernardino Co., Calif.; 79, Porthills, New Zealand; 81, Mount Pelion, Greece); 80, 82, ejaculatory apodemes in lateral view (80, Orient, N.Y., holotype; 82, Ohakune, New Zealand).



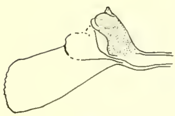
83. consimilis



84. fortnumi



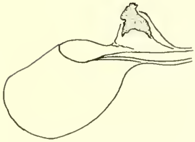
85. borealis



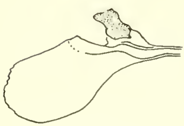
86. pallipes

87. similis

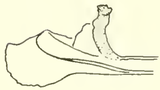
88. kuscheli



89. argigaster

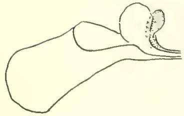


90. nitens

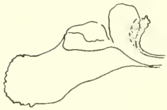


91. guttatus

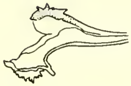
92. albiventris



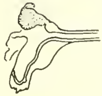
93. caffer



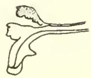
94. eugonatus



95. leptisoma



96. vittisternum

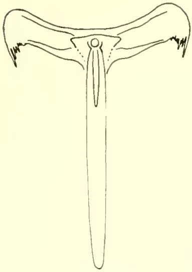


97. shewelli

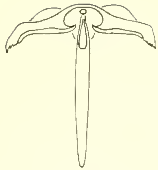
98. colei

Figures 83–98.—*Ogcodes* species, with ejaculatory apodemes in lateral view (83, Ohakune, New Zealand; 84, Upper Blessington, Tasmania; 85, Drews Gap, Oreg.; 86, Eyr's, Germany; 87, New Zealand, holotype; 88, Masatierra, Juan Fernandez Islands, Chile, paratype; 89, Cass, New Zealand, holotype; 90, Porthills, New Zealand; 91, Mount Pelion, Greece; 92, Muskegon, Mich.; 93, Matjesfontein, Cape Province, South Africa; 94, Morongo Valley, Calif.; 95, Queenstown, New Zealand, holotype; 96, Spokane, Wash.; 97, Cold Spring Harbor, N.Y.; 98, Mill Valley, Calif.).

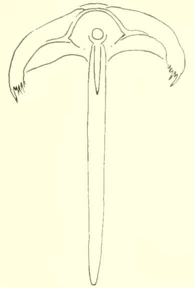
FIGURES 99–112.—*Ogcodes* species, with ejaculatory apodemes in anterior view (99, Sibuyan Island, Philippine Islands, holotype; 100, Orient, N.Y., holotype; 101, Acacia Plateau, New South Wales, Australia; 102, Eastham, Mass.; 103, Chascomus, Buenos Aires, Argentina, holotype; 104, Oak Creek Canyon, Ariz., paratype; 105, Houghron, Ontario, Canada, holotype; 106, Nova Teutonia, Brazil, holotype; 107, Currahee Mountain, Stephens Co., Ga., paratype; 108, Villeta, Cundinamarca, Colombia, holotype; 109, Budapest, Hungary; 110, Naivisha, Kenya; 111, Potsdam, Germany; 112, Angkor, Camdodia, holotype).



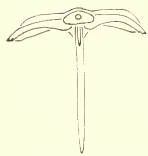
99. philippinensis



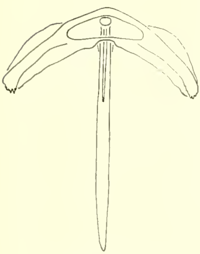
100. hennigi



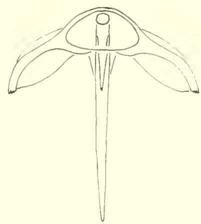
101. basalis



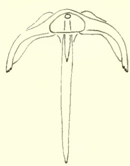
103. argentinensis



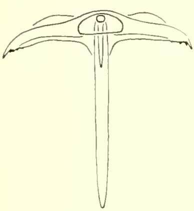
102. pallidipennis



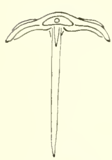
104 baharti



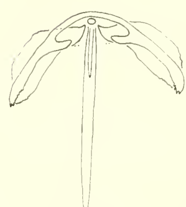
105. canadensis



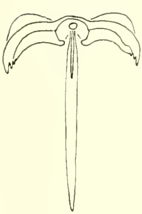
106. brasilensis



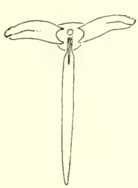
107 sabroskyi



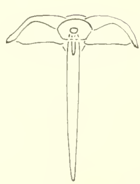
108. columbiensis



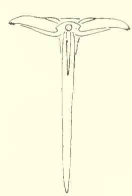
109. varius



110. clavatus



111. gibbosus



112. orientalis

Figures 99–112.—Explanation on facing page.

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CYDNIDAE OF THE WESTERN HEMISPHERE

By Richard C. Froeschner [1]

Introduction

The group of hemipterous insects treated here as a full family, the Cydnidae, exhibits definite pentatomoid affinities, even though a few of the genera possess only four segments in their antennae. This relationship has long been recognized and acknowledged, but the features separating the cydnids from the other pentatomoids have been accorded varying importance by different authors. Some workers contend that the pentatomoids comprise a single family with many subfamilies, thus according the cydnids subfamily rank under the Pentatomidae; others express the belief that the present group and the corimelaenid bugs deserve to be united into a single family, the Cydnidae or Corimelaenidae according to the authority accepted, while still others contend that even this arrangement is unsatisfactory and that each of these two groups are properly given full family status.

A clear-cut definition of the Cydnidae in the restricted sense, as now generally accepted and used here, is not easy to formulate. McAtee and Malloch (1931, p. 194) listed several features which they con-

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sidered to set the cydnid and corimelaenid bugs apart from the other Pentatomoidea, as follows:[2]

> . . . the presence of fringes of closely set, stiff, bristles at the apices of the mid and hind coxae and the spiracles of the second abdominal segment being in a membranous strip of the sternite, not in the heavily sclerotized portion. Members of these two subfamilies have tri-segmented tarsi, and distinct tibial bristles, and, with the exception of the Sehirini, have the trichobothria longitudinally arranged often nearly in line with the spiracles. The trichobothria, or delicate, pale, sensory hairs (which must not be confused with the strong, dark, lateral bristles which are frequently present) are two in number on each side of all sternites and in the other subfamilies of the Pentatomidae are arranged transversely, or nearly so, behind the spiracles.

Disregarding the corimelaenids which McAtee and Malloch (loc. cit.) adequately separated from the cydnids on the basis of the greater claval exposure and the absence of "an area of smooth chitin behind the eyes on the ventral surface of the head," the results of the present study agree with most of those statements. They confirm McAtee and Malloch's observations in the presence of the apical fringe of bristles on the middle and hind coxae, the presence of the distinct tibial bristles, the 3-segmented tarsi (except in *Scaptocoris* where the hind legs lack tarsi) and the location of the spiracle of the second abdominal segment. In contrast, the present results show that the description of the trichobothrial arrangement is not true for all genera in the Cydnidae. McAtee and Malloch apparently followed Tullgren (1918) concerning the location of these structures in Cydnidae. Tullgren's choice of two genera for study was unfortunate because both of them (*Sehirus* and *Gnathoconus*) were members of the subfamily Sehirinae, which agrees with the other pentatomoids in arrangement of these structures. Had he examined genera other than those in the Sehirinae he would have found that other trichobothrial patterns exist in the family. I have noticed that four additional arrangements occur in the family, so that it is possible to divide the Cynidae into five subfamilies on the basis of the trichobothria. Further discussion of these subfamilies based on the trichobothria and supporting characters will be found in the discussion under the family heading on a later page.

Thus, for differentiation of the Cydnidae from all other pentatomoids (except the corimelaenids which were separated above) there are four distinguishing features. Of these, the 3-segmented tarsus is least diagnostic because it is shared with nearly all other pentatomoids. The possession of distinct tibial bristles is shared with a few true Pentatomidae (i.e., *Strachia* in the subfamily Asopinae), but if this condition is restricted to a consideration of the lateral marginal row of stout spines on the more or less flattened anterior tibia it may be

[2] The parenthetical references to illustrations in the original have been omitted from this quotation.

considered diagnostic of all genera except *Scaptocoris* and the extralimital genus *Stibaropus*. The presence of a fringe of close-set bristles on the apices of the middle and posterior coxae and the location of the spiracle in the membranous anterior part of the second sternite are nearly unique within this superfamily, being shared only with the corimelaenids. As brought out later in this paper, the leg armature may be simply an adaptive feature for the fossorial habits of these insects and not at all an indicator of phylogenetic relationships. This character shows considerable variation from genus to genus. The same criticism may be valid for the coxal bristles, which are present only on the ventral or exposed side of the structure where they may be functional in preventing sand and grit from entering the articulation during burrowing. Therefore, even though these features furnish good recognition characters their actual value as indicators of phylogeny within the Pentatomoidea is open to question. This uncertainty in accepting proposed characters for separation of the groups included in the Pentatomoidea once again emphasizes the need for a very thorough study of the higher classification of the group. Until such a study is carried on by someone with access to collections containing goodly representation of all parts of the Pentatomoidea, I feel free to follow my usual tendency to be a "splitter" at the family level when the breaks in the morphology and biology of the groups permit a distinct and independent biologic-taxonomic concept to be formed.

The problems in the classification of this group have not been confined to the family level. Instead, they are evident at all levels. Previously only two subfamilies have been recognized, whereas at least five are strongly evident in the material at hand.

Most authors have considered the genera from one of two extremes—either with the idea that any prominent or unusual feature (regardless of its value as a phylogenetic indicator) automatically serves for the establishment of a genus, or, from the other extreme, that the limits of previously erected genera must constantly be expanded to take in new forms that appear regardless of the relationships of the species involved. The former approach has resulted in too many monotypic genera (i.e., *Colobophrys* Horváth, *Cryptoporus* Uhler, *Pachymeroides* Signoret, *Psectrocephalus* Van Duzee and *Syllobus* Signoret to mention some from the Western Hemisphere) as characters of no more than specific value often have been used, while the second method has resulted in a few "catch-all" genera (i.e., *Aethus* and *Geotomus* as accepted by most recent authors) that have worldwide distribution and consequently little or no zoogeographic significance. I believe that if a genus is to consist of a group of "closely related" species, consideration must be given not only to the characters which

separate the species but also to those which two or more species may have in common. This approach appears to be establishing a series of genera that are not only composed of "closely related" species but that also have restricted ranges of some zoogeographical significance.

At the species level there has been much confusion and great uncertainty concerning the application of trivial names. In great part this uncertainty has been due to the fragmentary and at times inaccurate original descriptions, and in part to the assignment of forms to the wrong genus. Many of the keys that have appeared have been drawn from misdetermined material and so could only lead to further error. Even some of America's outstanding hemipterists have been inconsistent in their assignments of names so that in the material available for study some species were determined first as one thing and later as another by the same worker. This point is brought up not to condemn the work of these men, but simply to show that even careful students were confused by the literature. Probably the most misused name in the cydnid literature of the Western Hemisphere was Uhler's *Pangaeus discrepans*. It was found attached to no less than six distinct species in three different genera, while specimens of true *discrepans* were found under three other names as well as the proper one. The most accurate determinations appear to have been made on those species which could be placed chiefly on distribution and with a minimum of morphological characters. With the literature and the work of specialists leading to such muddled results, the group has been in dire need of a thorough revision.

The present study is a revision of the known species of all included genera except *Sehirus*, of which only 1 of the 24 or more nominal species occurs in the Western Hemisphere.

The specific descriptions include the mean and extremes of measurements, in millimeters, from five individuals of each sex unless otherwise indicated. The color, unless otherwise stated, may be assumed to be the usual brownish black to black (yellow or light brown in teneral specimens) without conspicuous or important markings. The following abbreviations are used to indicate the collections in which specimens are housed.

AmN: American Museum of Natural History
Bon: F. Bonet
BrM: British Museum (Natural History)
CalAc: California Academy of Sciences
Cap: J. M. Capriles
Car: Carnegie Museum
Carv: J. C. M. Carvalho
CIS: California Insect Survey
Copen: Universitetets Zoologiske Museum, Copenhagen
HMH: H. M. Harris
Hung: Musée d'Histoire Naturelle de la Hongrie
Ind: University of Indiana

JAS: J. A. Slater
JCL: J. C. Lutz
KU: University of Kansas
LAMus: Los Angeles County Museum
MassU: University of Massachusetts
McC: A. T. McClay
MCZ: Museum of Comparative Zoology
Mex: Dirección General de Agricultura
MMZ: University of Michigan Museum of Zoology
OxUniv: Oxford University
Pel: D. Pelaez
Pur: Purdue University
RCF: R. C. Froeschner
RFH: R. F. Hussey
Rijks: Rijks Museum van Natuurlijke Historie
RLU: R. L. Usinger
Stock: Naturhistoriska Riksmuseum
UnivNac: Universidad Nacional de La Plata
UnivTuc: Universidad Nacional de Tucumán
USNM: U. S. National Museum
Wien: Naturhistorisches Museum

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For the generous loan of type specimens, the author is deeply obligated to the following individuals and the institutions they represent: Dr. M. Beier, of the Naturhistorisches Museum, Vienna, for the loan of many of Signoret's types; to Dr. R. Malaise, Entomologiska Avedelingen, Naturhistoriska Riksmuseum, Stockholm, for loan of Stål's types and one of Signoret's types; to Drs. A. Soos and E. Halaszfy, Musée d'Histoire Naturelle de la Hongrie, Budapest, for the loan of certain Horváth types; to Dr. S. L. Tuxen, Universitetets Zoologiske Museum, Copenhagen, for Jensen-Haarup types; and Dr. B. A. Torres, Universidad Nacional de la Plata, Buenos Aires, for a variety of Berg material including one type and several Stål-determined specimens. Paratypic material of some of Van Duzee's species was made available from the collections of the California Academy of Sciences, San Francisco, Calif., by Dr. E. S. Ross and from the U.S. National Museum by Dr. R. I. Sailer. For data from the types in institutions whose policy prevents the lending of types, I am grateful to Dr. H. C. Blöte of the Rijks Museum van Natuurlijke Historie, Leiden, Netherlands, for comparison of specimens with Signoret types; to Dr. W. China of the British Museum (Natural History) for notes on Dallas, Walker, Signoret, and Distant species; to Dr. W. Davidson of the Art Gallery and Museum, Perth, Scotland for help in locating certain Signoret types; to Dr. M. W. R. de V. Graham of Oxford University for notes on Westwood types; to Dr. N. Kormilev, Buenos Aires, who made every effort to help with information on the few remaining Berg types in the several Argentine museums; to Dr. H. Ruckes, New York, N. Y., for notes and sketches of his types in the American Museum of Natural History; and to Dr. R. I. Sailer who furnished information on the Uhler types in the collection of the U.S. National Museum.

More than 12,000 specimens have been made available for study from numerous institutional and private collections, as follows: American Museum of Natural History by Dr. M. Cazier, Dr. H. Ruckes, and Mrs. P. Vaurie; British Museum (Natural History) by Dr. W. E. China; California Academy of Sciences by Drs. E. S. Ross, H. B. Leech and J. W. Green; Carnegie Museum by Dr. G. Wallace; Museo Nacional de Historia Natural, Santiago, Chile, by Dr. D. S. Bullock; Dirección General de Agricultura, Mexico City, by Dr. F. Bonet; Eastern Illinois State College, Charleston, Ill., by Dr. G. Riegel; Illinois Natural History Survey, Urbana, Ill., by Dr. H. H. Ross; Instituto de Ecologia e Experimentação Agrícolas, Rio de Janeiro, by Dr. D. Mendes; Iowa State College, Ames, Iowa, by Drs. H. M. Harris and J. L. Laffoon; Los Angeles County Museum, Los Angeles, Calif., by Dr. F. Truxal; University of Michigan Museum of Zoology, Ann Arbor, Mich., by Drs. T. Hubbell and R. F. Hussey; Universidad Nacional de La Plata, Buenos Aires, by Dr. B. A. Torres; Museum of Comparative Zoology, Cambridge, Mass., by Dr. J. Bequaert; Naturhistorisches Museum, Vienna, by Dr. M. Beier; Oregon State College, Corvallis, Oreg., by Dr. V. D. Roth; San Diego Museum, San Diego, Calif., by Mr. J. D. Lattin; Universidad Nacional de Tucumán, Tucumán, Argentina, by Dr. K. J. Hayward; University of California, Berkeley, Calif., by Dr. P. D. Hurd, Jr., and Mr. J. D. Lattin, and from the Division of Entomology and Parasitology of the same institution, Davis, Calif., by Dr. A. T. McClay; University of Kansas, Lawrence, Kans., by Dr. R. H. Beamer; University of Massachusetts, Amherst, Mass., by Dr. M. E. Smith; U.S. National Museum, by Drs. R. I. Sailer and H. G. Barber; and Washington State College, Pullman, Wash., by Dr. M. T. James. The following individuals lent their private collections for study: Dr. F. Bonet, Mexico City; Dr. D. S. Bullock, Angola, Chile; Dr. J. M. Capriles, Mayaguez, Puerto Rico; Dr. J. C. M. Carvalho, Rio de Janeiro; Dr. H. M. Harris, Ames, Iowa; Dr. R. F. Hussey, Gainesville, Fla.; Mr. J. D. Lattin, Berkeley, Calif., Mr. J. C. Lutz, Philadelphia, Pa.; Dr. D. Pelaez, Mexico City; Dr. J. A. Slater, Storrs, Conn.; and Dr. R. L. Usinger, Berkeley, Calif. To all these individuals and the institutions mentioned, the author expresses sincere appreciation.

Real help in the pursuit of this project also came in other forms from certain colleagues on the staff at Iowa State College, the scene of this research. Dr. H. H. Knight has been especially generous of his time in discussing many of the problems that have arisen and in giving valued opinions on them; in addition, he has opened his unusually complete and valuable library of older volumes for unrestricted use. I also appreciate the help received from Drs. H. M.

Harris, J. L. Laffoon, J. A. Slater, P. F. Bonhag, and J. C. M. Carvalho for various aids, including discussions, opinions, testing of keys, and the loan of literature.

The illustrations are the artistic contributions of my wife, Elsie Herbold Froeschner. The first four plates, those of the full figures, were done in a carbon-dust technique in which carbon dust was applied with a dry brush to a paper with a special chalked surface. I am sincerely grateful for these beautiful illustrations, and also for her aid in many ways.

I gratefully acknowledge important financial help toward completion of this manuscript for publication that was furnished by the Research Foundation at Montana State College through Dr. Leon Johnson.

Review of the Literature

The written history of this group began in 1803 with Fabricius' description of the genus *Cydnus*, despite the fact that some of the species had been described previously by Fabricius and Linnaeus in the latter's inclusive genus *Cimex*. *Cydnus* originally contained 15 species, of which several (including the American species *lugens* and *umbraculatus*) have subsequently been shown to be noncydnids. In 1820 Billberg gave the first suprageneric recognition of the group when he referred to it as the "Cydnides." This event has generally been conceded to mark the historical beginning of the family name.

The subsequent literature was mostly of a descriptive or listing nature with few efforts at revisionary or synoptic work. Of the latter, the important ones for cydnid studies in the Western Hemisphere began with Amyot and Serville's (1843) foundation for the modern systematics of hemipterology in their "Histoire Naturelle des Insectes, Hémiptères." The work appears quite sound in assembling and presenting a table to the known genera (eight of them new) of the world. The genera, which in definition and extent seem quite modern, were further arranged into two "Groupes" or subfamilies, the "Cydnides" and the "Sehirides." The soundness of these two categories is confirmed by their almost universal use by subsequent authors. The next important works with a world scope were the catalogs of Dallas (1851) and Walker (1867, 1868[3]). Except foi Dallas' table to the known genera, both of these works were enumerations with descriptions of new forms.

During this latter period, 1851–1867, exclusively American studies began to appear. These started with Stål's studies, one on the Brazilian forms (1860) and one on the Mexican forms (1862). These

[3] In this paper Walker described as a Cydnidae the new genus and species *Mentisa smaragdina* from Brazil. Dr. China, after examination of the type in the British Museum, reported that it did not belong to the Cydnidae but was a Pentatomidae in the restricted sense.

studies contained several new genera and species but nothing of a synoptic nature. In 1875 Uhler began a series of contributions that proposed new genera and species in that year and the next, and eventually, in 1877, led to a monograph on the Cydnidae known to occur in North America. Uhler's works, which first introduced the use of the important osteolar structures, appear to have been inclusive and careful studies and they do not exhibit excessive generic splitting as certain later authors seem to have believed. Shortly after Uhler's monograph, Carlos Berg (1879, 1884, 1891) published some important studies on Argentine and Brazilian forms. Unfortunately, even though Berg was corresponding with Stål, his identifications were not reliably accurate and his descriptions were not diagnostic. In 1880 the first volume on the Rhynchota in the now-famous Biologia Centrali-Americana appeared. The list of cydnids known from the included territory, including descriptions of new forms, was by Distant. No keys were given in the cydnid section and the colored illustrations offer little help in identifying the species.

Returning again to publications with a world-wide scope, one finds a list of known species in Stål's (1876) "Enumeratio." In 1879 Signoret began a series of cydnid studies that eventually culminated in a "Revision" that appeared in a series of papers from 1881 to 1884. This revision, the only attempt to include all the forms of the world in a single such study, contained a key to genera, descriptions of genera and species, and 228 attractively executed illustrations. Unfortunately, the fine appearance of the paper is misleading when an attempt is made to use it. There are several serious errors in the key, the descriptions and illustrations are often inaccurate, and certain earlier species are omitted. In addition, the generic conclusions presented there are not supported by the present study, particularly those which led Signoret to synonymize many of Uhler's genera and to create a number of monobasic genera. The "Catalogue Général des Hémiptères" by Lethierry and Severin (1893) was the last major catalog [4] of the species for the world.

Since the turn of the century several papers have presented keys to permit identification of cydnids from one or more countries within the scope of the present paper. They were Barber and Bruner's (1932) Cuban study, Barber's (1939) report on most of the Hemiptera of Puerto Rico and the Virgin Islands, and Torre Bueno's (1939)

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[4] Kirkaldy's second part of his general catalog of the Hemiptera had been completed in manuscript and was partially in galley proof at the time of his death. Unfortunately, this second part of the catalog was never brought to publication. Instead, the manuscript and partial galley proof were eventually deposited in the U.S. National Museum. Through the very generous cooperation of Dr. Reece Sailer of that institution, the manuscript and galley proof were entrusted to me during these studies. They have been of inestimable value. Some consideration was given to the possibility of bringing Kirkaldy's catalog to publication, but the great number of changes in generic assignment of species necessitated by redefinitions of genera prevents any such move until I complete studies on the genera of the world.

"Synopsis of the Hemiptera-Heteroptera of America North of Mexico." The first two of these appear to be too fragmentary to be of much use, even in the territory for which they were designed; and the latter obviously was taken directly from the literature, thus offering no real innovations except to introduce a new error. The first checklist of North American Cydnidae was contributed by Uhler (1886). Van Duzee (1904), Banks (1910), and Van Duzee (1916, 1917) followed with their catalogs for the same general territory. For the tropical part of the hemisphere there have appeared only two checklists that have attempted to review much material in this group and, consequently, were able to list more than a few species. One of these lists was by Pennington (1920) for Argentina and the other by Wolcott (1948) for Puerto Rico.

In the above-mentioned studies and in certain other less extensive but surely no less important papers, there have been proposed 164 species of the Western Hemisphere; these have involved 36 generic names in the systematics of the Cydnidae of the New World. As might be expected, many of the specific names are just synonyms of the commoner species of the area. This compares with the present study in which 141 species are treated in 15 genera.

Taxonomic Morphology

The family Cydnidae comprises a superficially monotonous group of spinose, usually unicolorous, similar forms. This is even more descriptive of the species of the Western Hemisphere than of those of the Eastern Hemisphere where several show interesting color patterns. But this similarity is more apparent than real. There are numerous, easily used characters that permit the arrangement of most of the species into clear-cut, often readily recognized groups.

A brief summary of the morphology of the Cydnidae with emphasis on those features used more commonly in this study will aid in interpreting the following classification and descriptions (see figs. 17, 18 for general illustrations of the gross anatomy). The characters most employed in the taxonomy of the Cydnidae are derived from the vestiture (including the punctures from which the hairs arise), the osteolar structures, the venation of the posterior wings, the modifications of structural shapes and relative lengths of body parts, the surface sculpture, and the genitalia.

The head presents several features for use in generic definition. The number of antennal segments may be four or five, with the second sometimes very short (fig. 65) and usually with small, very narrow, weakly sclerotized "ring segments" (not to be counted) between segments III and IV and between IV and V. The labium is always of four segments, of variable length, simple or with a semicircular

foliaceous lobe on segment II. The head bears two types of vestitures. The first type is the primary setae, which arise from a series of punctures and appear to be a constant and basic feature of nearly all species except those in *Sehirus*. There are usually three primary setae present, one on the apical half of each jugum, one anterior to the inner half of each eye, and one in the lateral angle of the preocular part of the head (fig. 43), or there may be more present as in *Amnestus*, which has four (fig. 59), or fewer as in *Ectinopus*, which has two (fig. 66), or there may be none, as in *Sehirus*. The secondary type of vestiture shows considerable generic and specific variation and consists of a variable row of setigerous punctures that may extend from the eye to the apex of the head where the tip of the clypeus is involved, or the row may be partial or reduced to a single setigerous puncture anterior to the eye. This single puncture is, in reality, the lateral primary puncture, but because it is usually incorporated in the row of secondary submarginal setigerous punctures, it may be discussed more clearly as a member of that series. The setae that arise from these submarginal punctures may be long, slender, and hairlike, referred to here as "hairs," or they may be short, stout, and blunt, referred to as "pegs"; interpretation of these types of submarginal setae is difficult because the burrowing habits of the insects may cause the hairs to be broken off near the base and the remaining part will be short and blunt, suggesting the pegs. The absence or presence of ocelli in American Cydnidae appears to be a specific feature, as does the location of the ocelli in relation to the eyes, the surface sculpture, the length of the antennal and labial segments, the relative lengths of the juga and clypeus, and the development of the bucculae.

The features offered by the prothorax, except for the presence or absence of a sharply impressed, subapical line paralleling the anterior margin from side to side, appear to be chiefly of specific value. In several genera certain species show a sexual dimorphism in that the lateral margins of the male pronotum are noticeably constricted, while those of the female are entire. Although such a feature might be conspicuous, it is extremely variable within the group, and often within one species; because this feature appears of questionable survival value and surely of no phylogenetic significance, it should not be accorded more than specific importance. Most species other than those of the genus *Sehirus* present a lateral, submarginal row of setigerous punctures. The arrangement and number of these setigerous punctures furnish good specific features. The pronotal surface is divided into an anterior and posterior lobe by a more or less distinct transverse impression near or behind the middle. The anterior lobe is often modified in the males; it may be tumid and/or variously impressed medially near the apex. The posterior lobe shows a

somewhat nodular prominence, or umbone, near each lateral margin and a differing surface sculpture. Anteriorly, on either side of the midline of the prosternum, there may be present a longitudinal ridge—the prosternal carinae.

The dorsal surfaces of the mesothorax and metathorax, except for the scutellum of the latter, are usually hidden from view and so have been little used for taxonomic characters. In all species except those of *Amnestus* the scutellum is typically pentatomoid in that it is very large and surpasses the apices of the clavi, preventing the latter from coming together to form a claval commissure. Therefore, it is quite surprising to find that in *Amnestus* the scutellum is very short, permitting the clavi to reach beyond its apex and form a claval commissure. The scutellum itself varies in ratio of length to basal width and in having the apex narrowed (fig. 79) or not (fig. 80). The subapical width of the scutellum at the level of the claval apices is often a useful measurement when compared with the width of the membranal suture, the line of union between the apex of the corium, and the base of the membrane. The ventral aspects of the mesothorax and metathorax furnish a number of characters of generic, subgeneric, and specific importance. In the present paper the area laterad of the coxal insertions is referred to as the pleuron, that between the coxal insertions as the sternum. A dull, finely roughened evaporatorium may be present or absent on the pleurae of one or both segments; its occurrence plus its extent may be of varying value depending on the species under consideration. The punctation in the polished area laterad of the evaporatorium, referred to as "lateral area," may be of specific value. The metapleuron bears the external opening of the scent gland, usually referred to as the osteole. The osteole occurs in a cuticular modification referred to here as the peritreme. The peritreme consists of a pair of close-set transverse ridges which may or may not be in contact along their summits; the anterior ridge is usually more strongly developed and frequently modified beyond the osteolar opening. When present, this apical modification furnishes good characters for definition of genera. The osteolar opening may be situated ventrally on the peritreme, or posteriorly where it is concealed by a projecting ledge. In *Amnestus* the middle carina of the mesosternum and metasternum is strongly elevated, separating the coxal cavities.

The basal thickened part of the anterior wing is divided into three main areas—the clavus next to the scutellum, the triangular discal area or mesocorium between the clavus and the radial vein, and the narrow exocorium between the radial vein and the costa. The distinctness, relative sizes, and punctation of these areas plus the presence or absence of a variable number of setigerous punctures on the

costa furnish very useful specific characters. The venation of the posterior wing, especially in the anterior part, has yielded some valuable features for defining subfamilies. The veins of the metathoracic wings are somewhat confusing due to fusions and the presence of only incomplete segments of others. This has led to a difference in terminology concerning them. The conclusions presented by Malouf (1932) for the pentatomid *Nezara viridula* appear applicable and are used here (fig. 167). The anteriormost vein, Sc+R, is distinctly sclerotized from base to a subapical fracture, beyond which it is much weaker. Apically Sc+R and M are connected either by a crossvein, r–m, or by running together. In some cases, M sends an oblique spur or hamus into the radial cell near its midlength.

The legs furnish many characters in the shape of parts and the number and arrangement of the spines. Special modifications are very usable features—the anterior tarsal insertions at or proximad of the tibial apex, the diameter of tarsal II in relation to I and III, the shape of the tibiae (expecially the posterior ones), the presence or absence of ventral armature on the femora, and others.

The dorsum of the abdomen has not yet been extensively explored for characters but does appear to present some. The sternites, however, furnish a number of very important characters for use at all levels within the family. There are always seven pregenital sternites, but the entire first sternite and the anterior part of the second, including the spiracle of the latter, are membranous, inseparable, and usually concealed from view. The complete sternites on which spiracles are visible are III to VII. In the male, sternite VIII also bears a spiracle but is telescoped into the apex of the abdomen. The male genital capsule in Hemiptera has been shown by Bonhag and Wick (1953) to be composed ventrally and laterally of the fused gonocoxopodites and dorsally of the last three abdominal segments, IX, X, and XI. These authors further point out that the structures commonly referred to as the parameres are actually the gonostyli or claspers. By definition the paramere is a lateral appendage of the phallobase, not of the gonocoxopodite. As yet, I have not explored the phallic structures for taxonomic worth in the Cydnidae, but there is no reason to believe that they will prove to have any less value here than has been demonstrated for other pentatomoids by Leston (1952) and other workers. As shown by Bonhag and Wick (loc. cit.) for the banded milkweed bug, *Oncopeltus fasciatus*, abdominal segment VIII of the female is visible dorsally as a dorsal plate flanked by a pair of laterotergites that bear one spiracle apiece. Since the pentatomoids apparently do not possess an ovipositor, the homologizing of the female terminalia with those of the lygaeid *Oncopeltus* is not reliable without a more intensive

study than could be undertaken at the present time. Laterally in the spiracular area of sternites III to VII there occurs a pair of sensory hairs or trichobothria. Just what it is that the hairs "sense" appears controversial. When Hansen (1917, p. 258) reviewed and discussed the subject of external sensory hairs he concluded, "But I think I have shown with tolerable certainty that the trichobothria in terrestrial Arthropods are scarcely auditory organs but tactile hairs of special structure." Tullgren's (1918) study of the trichobothria on Hemiptera contained illustrations of them and resulted in some interesting speculations on their role in the higher classification within the order. His conclusions on the Cydnidae were based on an unfortunate choice of two genera of the subfamily Sehirinae; all members of that subfamily agree with the Pentatomidae proper in having two trichobothria arranged in a transverse row behind each spiracle. If he had chosen genera of any other subfamily he would have realized that other patterns also existed in the family. In fact, the present study recognizes four additional arrangements, making it possible to establish five subfamilies on the basis of the trichobothrial arrangements in both the nymphs and the adults. These categories can be supported by additional features derived from other parts of the body. For further information on such use of the trichobothria the reader is referred to the discussion under the family heading.

Measurements were taken in a standard manner. Width and length of head, transverse ocellar width, and size of space separating eye and ocellus were taken from a dorsal view of the head which placed the greatest expanse of outline at right angles to the line of vision; the greatest length of antennal and labial segments was taken from side view; the pronotum was held so that a plane through the margins was at right angles to the viewer and the length was measured along the midline and the width across the humeri; the scutellum likewise was held at right angles to the line of vision and the length was taken along the midline from the bottom of the basal transverse impression to the apex, and the width was measured basally with the lateral ends of the curved basal impression forming the points of limit. The total length of the insect is that of the body alone, the position of the membrane being too variable to give a fixed point for measuring; but even the "length of body" is not as accurate as might be desired because the position of the head often varied from specimen to specimen. All measurements are given in millimeters.

The term alutaceous does not appear to have common usage in hemipterology but is very helpful in describing the surface microsculpture of some of these insects When a surface is alutaceous

it appears dulled due to the presence of numerous minute, intersecting cracks and wrinkles like those on the surface of human skin.

Family Cydnidae

Cydnides Billberg, 1820, p. 70.

Size small to large, 1.6–16.1, oblong to oval, dorsum subdepressed to strongly convex, venter strongly convex.

Head: Quadrate to semicircular, more or less widened or explanate laterally; antennae 4- or 5-segmented, inserted ventrally on head near ventral angle of eye; ventral surface of eye attaining posterior margin of head; labium 4-segmented, inserted near or beneath apex of clypeus, surpassing base of head, sometimes reaching well onto abdomen.

Thorax: Pronotum large, concealing mesonotum and metanotum except for the usually very large, triangular or subtriangular scutellum; clavus and corium opaque, latter subtriangular, broadened at apex, frenum reaching beyond middle of scutellum; membrane with veins usually weak, simple or anastomosing; legs more or less strongly spined on tibiae, especially anterior pair which are more or less flattened and have single row of very stout, blunt spines on lateral margin (except in Scaptocorinae); middle and posterior coxae with apical fringe of close-set bristles (fig. 114); tarsus 3-segmented (absent from posterior legs of *Scaptocoris*). For additional discussion of family definition within the Pentatomoidea see the introduction.

Biological information concerning the Cydnidae is scattered and mostly fragmentary. But from what has been published there may be deduced a rather incomplete outline of the life cycle. Biologically the Cydnidae may be considered in two groups. One group consists of species like those of *Sehirus* (not necessarily all Sehirinae) in which both the nymphal and adult stages feed on parts of plants that grow above ground; in so doing they closely resemble the activities of the great percentage of the Pentatomoidea. The second type, which is apparently characteristic of species of all cydnid genera except *Sehirus*, involves nymphal and adult feeding on roots and possibly other underground parts of plants. This habit of underground feeding has suggested for the family the popular name of "burrower bugs."

Although no life history of an American cydnid has appeared in literature, the activities of *Sehirus cinctus* (Beauvois) probably can be predicted somewhat from results published on certain European members of the genus. Southwood (1949) and Southwood and Hine (1950) have given a rather full account of *Sehirus bicolor* (Linnaeus)

in England and an abstract of their "Notes" may indicate what can be expected of *Sehirus cinctus* in North America.

> Adults hibernate under soil. In spring they become active, mate, and lay some 40 eggs in a cluster in the soil or under protective leaves or stones. The female remains close above the ball of eggs, apparently ready to defend it. The incubation period varies from 18 to 24 days. The nymphs and adults usually remain together for about 48 hours after hatching. They feed on the above-ground parts of plants, chiefly those of the family Labiatae, with most nymphal feeding apparently concentrated on the floral or fruiting parts of the plants. Adults of *bicolor* also have been collected from plants other than Labiatae. About seven weeks are required to reach maturity. Since there is only one generation each year the adults must live about nine months.

The life history of another European *Sehirus*, *S. sexmaculatus* Rambur, was reported by Boselli (1932); except for minor details the two life histories are very similar.

Scattered notes on life histories of cydnid genera other than *Sehirus* indicate that they are chiefly root-feeders in nymphal and adult stages. They apparently hibernate as adults and begin reproduction in spring. Some forms have been reported (see Carvalho, 1952, p. 1) as feeding on roots "two meters below the surface of the soil" where they were associated with root galls some 4 inches in diameter. Such subterranean activities are an effective shield against observation, and unless some of these insects become of major economic importance there is little likelihood that anyone will attempt to make a detailed study of the life history of even one of them.

In the classification of the Cydnidae, the first subdivislon into supra-generic segments appeared in Amyot and Serville (1843) where the two "groupes" "Cydnides" and "Sehirides" were established chiefly on the shape of the anterior tibiae. "Cydnides" were described as having the anterior tibia broader and flatter with strong spines on the outer margin in all included genera except *Scaptocoris;* "Sehirides," in contrast, were said to have the anterior tibiae only slightly flattened and to be without strong spines on the outer margin.

This division on the same characters was accepted by Stål (1864), who latinized the names and added the narrow filiform shape of the tarsus of the Cydnida and the more slender second tarsal segment of Sehirida. This separation was used by Stål and subsequent authors until Signoret (1881b) proposed that these two groups be separated on the basis of the presence or absence of certain setigerous punctures on the head and thorax. Signoret's characterization kept most of the genera in the same groups in which earlier workers had placed them, but did require the shifting of *Lobonotus* Uhler to the Sehirides. This shift is not supported by findings in the present study. These two taxa have long been considered the primary categories in the

Cydnidae. No other suprageneric separation occurred until Hart (1919) recognized the aberrant conditions exhibited by *Amnestus* and erected the tribe Amnestini for it.

In evaluating the characters mentioned above, one must conclude that the expanded anterior tibia is undoubtedly an adaptive feature—an adaptation to a burrowing habit—and, as such, probably does not deserve consideration as a prime phylogenetic indicator, though it may have value as a convenient key character. The presence of setigerous punctures on the submargin of the head and thorax is also probably adaptive in supplying tactile hairs for the burrowing habit. The narrower second tarsal segment pointed out by Stål (loc. cit.) probably could be construed as giving greater flexibility of the tarsus for the plant-climbing habit of the members of the genus *Sehirus* in which it occurs, while the other forms, which are chiefly burrowers, would require the stout, more rigid tarsus for efficient handling of the soil.

The present investigation to find more reliable phylogenetic indicators resulted in the selection of certain features that have already shown such value in other pentatomoids; namely, the arrangement of the trichobothria on the heavily sclerotized sternites III to VII (figs. 170–174) and the pattern of the venation of the posterior wing. The arrangement of the trichobothria in both the nymphs and the adults indicates five major groups of Cydnidae, as tabulated below:

1*a*. Sternites III and IV without trichobothria, V to VII each with a single trichobothrium posterior to the spiracle (fig. 173) . . . . **Amnestinae**
1*b*. Sternites III to VII each with two trichobothria.
  2*a*. Trichobothria of sternites III to VII posterior to spiracles.
    3*a*. Trichobothria arranged in transverse pairs (fig. 171) . . . **Sehirinae**
    3*b*. Trichobothria arranged in longitudinal pairs (fig. 174) . **Garsauriinae**
  2*b*. Ventralmost trichobothrium of anterior sternites (or all sternites) mesad or anterior to spiracle.
    4*a*. Sternites III to VII with one trichobothrium more anterior in position than spiracle and one (not always strongly developed) posterior to it (fig. 170) . . . . **Scaptocorinae**
    4*b*. Trichobothria of sternites VII and usually also of VI both posterior to spiracle (fig. 172) . . . . **Cydninae**

The arrangement of the trichobothria on the several posterior segments in the Cydninae is contrary to the statement of McAtee and Malloch (1931, p. 194) that Thyreocoridae and Cydnidae "with the exception of the Sehirinae, have the trichobothria longitudinally arranged often nearly in line with the spiracles." The present grouping of the Cydnidae into five subfamiles can be given additional support from characters drawn from the venation of the posterior wing, as explained below.

The earliest taxonomic use of the venation of the hindwing was by Fieber (1861), who employed it in the first couplet in his key to

the European genera but did not establish any named categories upon the results. Unfortunately, his choice involved the close approximation of the basal halves of the Sc+R and M, a feature which apparently occurs with some irregularity in the Cydnidae so that even otherwise closely allied genera may not agree in this character, though they may agree in it with more distantly related forms. The results of the present study of venational features (figs. 165–169) permit forming the following tabulation, which agrees with the results obtained above from the trichobothria.

1*a*. Sc+R recurved at apex to meet M (fig. 168) . . . . **Amnestinae**
1*b*. Sc+R straight, connected to M by a more or less strongly oblique cross vein.
  2*a*. Cross vein r–m very strongly oblique so that M1+2 leaves radial cell basad of fracture in Sc+R (fig. 165) . . . . **Scaptocorinae**
  2*b*. Cross vein r–m not so strongly oblique, M1+2 leaving radial cell beyond fracture in Sc+R.
    3*a*. Vein M with a spur or lobe projecting into radial cell at its midlength.
      4*a*. Three veins arising independently from apex of radial cell (fig. 169). **Garsauriinae**
      4*b*. Two of the three veins arising at antero-apical angle of radial cell, third one from posteroapical angle (fig. 166) . . . **Sehirinae**
    3*b*. Vein M without trace of spur or lobe projecting into radial cell (fig. 167) . . . . **Cydninae**

Thus, with evidence drawn from two nonadaptive characters of the Cydnidae it is possible to establish five subfamilies. Unfortunately, both of these features are somewhat difficult to use, either because of their small size or the fact that they are normally hidden from view. But a survey of the other characters of these insects shows that a much more usable key to the subfamilies can be based on certain more conspicuous characters. Such a key to the subfamilies follows.

General key to the subfamilies of Cydnidae

1. Clavi meeting beyond short scutellum and forming a commissure almost as long as scutellum (fig. 2) . . . . **Amnestinae** (p. 628)
   Clavi not meeting beyond scutellum, not forming a claval commissure . . 2
2. Anterior tibia strongly cultrate, much produced beyond tarsal insertion so that tarsus appears to arise at middle of tibial length (fig. 3). **Scaptocorinae** (p. 365)
   Anterior tibia not cultrate, tarsus arising at or very near apex of tibia . . 3
3. Pronotum with a lateral, submarginal row of setigerous punctures; tarsal II subequal in diameter to I and III . . . . **Cydninae** (p. 377)
   Pronotum without a lateral, submarginal row of setigerous punctures; tarsal II distinctly narrower than I and III 4
4. Antennal II as long as or longer than I; pronotum without fine, distinctly impressed subapical groove . . . . **Sehirinae** (p. 354)
   Antennal II less than half as long as I; pronotum with fine, distinctly impressed subapical groove paralleling anterior margin (fig. 65). **Garsauriinae** (p. 364)

Subfamily Sehirinae

Sehirides Amyot and Serville, 1843, p. 96.

Diagnosis.—Either the arrangement of the two trichobothria of sternites III–VII in a transverse row posterior to the spiracle (fig. 171) or the venation of the metathoracic wing (fig. 166, shape of radial cell and presence of a hamus) will define this group in the technical sense. For greater ease of identification of the sole species of the only genus that occurs in the Western Hemisphere, one may rely on the narrow, creamy white lateral margins of the pronotum, corium, and abdomen.[5]

Description.—Head: Margins entire; antennae 5-segmented; labial II simple.

Wings: Posterior wing (fig. 166) with r–m joining M distad of fracture in Sc+R; Sc and R leaving radial cell at antero-apical angle; radial cell receiving hamus from M.

Scutellum: Long, surpassing apices of clavi, latter not forming commissure posterior to scutellar apex.

Thoracic pleurae: Posterior margins well developed; propleuron with anterior and posterior convexities; mesopleuron with posterior margin touching or overlapping anterior edge of metapleuron for most or all of width; metapleuron with posterior margin reaching base of abdomen across full width, completely covering internal part of hind coxa.

Legs: Anterior tibia weakly compressed, with row of small blunt spines on dorsal margin; tarsi inserted at apices of tibiae, with II more slender than I or III.

Sternites (fig. 171): Sutures nearly straight, not sinuate laterally; III to VII each with two trichobothria in transverse row behind spiracle.

Terminalia: Male genital capsule opening dorsally.

Type of subfamily.—Genus *Sehirus* Amyot and Serville (1843, p. 96).

Distribution.—Members of the Sehirinae have been reported from all major faunal regions of the world except the Australian and Neotropical. The range of the single New World species extends southward from southern Canada into Mexico.

Discussion.—This subfamily, as defined here and in the key to subfamilies, is now known to contain the two genera *Legnotus* Schiödte (=*Gnathoconus* Fieber, vide China, 1943) and *Sehirus* Amyot and Serville. Only *Sehirus* has been found in the Western Hemisphere. A more detailed discussion of this genus is given below.

[5] One other species in the New World has a creamy white costa, but it lacks the pale edges on the pronotum and abdomen.

Genus *Sehirus* Amyot and Serville

Sehirus Amyot and Serville, 1843, p. 96.
Tritomegas Amyot and Serville, 1843, p. 98.
Canthophorus Mulsant and Rey, 1866, p. 344.
Adomerus Mulsant and Rey, 1866, p. 356.
Lalervis Signoret, 1881a, p. 656.

Pending the completion of the author's studies of the Cydnidae of the Eastern Hemisphere, the conclusions of China (1943) concerning this genus are here accepted without question. The decision to do this was a practical solution to a very complex problem which would have involved review of a very extensive literature on a genus whose main area of distribution is removed from the geographic region under consideration.

Diagnosis.—Among the genera of the Western Hemisphere this genus may be recognized by any of many features: i.e., weakly compressed anterior tibia which is almost square in cross section; lack of distinct prosternal carinae; creamy white lateral margins to pronotum, corium, and abdomen; the scimitar-shaped terminal process of the osteolar peritreme; and others.

Description.—This description is based primarily on the New World forms, but it is modified to encompass all Old World forms available. The Eastern Hemisphere species at hand during this study included *bicolor* Linnaeus, *biguttatus* Linnaeus, *dubius* Scopoli, *luctuosus* Mulsant and Rey, *sexmaculatus* Rambur, and one unidentified Oriental species.

Size small to moderate; oval, widest behind middle; dorsum moderately convex, venter more strongly so.

Head: Length usually more than three-fourths of width, eyes projecting by half or more of their width; juga equal to or longer than clypeus, sometimes convergent or contiguous beyond clypeus; surface convex or concave, margins narrowly to broadly reflexed, closely and coarsely punctured over most of surface; ocelli present, small, situated on or behind a line connecting hind margin of eyes; antennae 5-segmented, I shortest, IV subequal to or shorter than V, each longer than II and III, latter subequal to or longer than II; bucculae moderately to very high, nearly or quite reaching base of head, evanescent or abruptly terminated posteriorly; labium reaching between middle of hind coxae, I shortest, II longest, III longer than IV, II slightly compressed but without a foliaceous semicircular lobe.

Pronotum: Length not more than half of width, margin carinate, sides convexly narrowed from base, without lateral submarginal row of setigerous punctures; anterior margin slightly to moderately deeply concave; transverse impression moderate to obsolete, marked

by a wide band of distinct punctures; posterior margin broadly but very weakly convex; all angles rounded.

Scutellum: Longer than broad, triangular, apex narrowed and less than half of membranal suture; disk with numerous distinct punctures over most of surface.

Hemelytra: Areas well defined, membranal suture straight, convex or moderately bisinuate; corium and clavus distinctly, closely, and more or less uniformly punctured; costa thickened, impunctate, inflexed part distinctly punctate; membrane less than half of hemelytral length, reaching or surpassing apex of abdomen, transparent and weakly to strongly clouded with brown.

Propleuron: Usually punctured, sometimes tuberculate; prosternal carinae very low or absent, anterior margin usually without expansions.

Mesopleuron (figs. 86, 87): Nearly flat, evaporative area restricted to posterior two-thirds or less, often reaching side margin where it is sometimes extended anteriorly; shining part punctured; mesosternum distinctly carinate on midline.

Metapleuron (figs. 86, 87): Slightly convex; terminal lobe of peritreme elevated, strap-shaped or reniform, more or less shining, longer than basal part; evaporative area either just surrounding osteolar canal or more extensive, sometimes occupying mesal three-fourths of segment; shining part variously punctured.

Legs: Moderately long, slender; anterior tibia (fig. 130) not surpassing tarsal insertion, weakly compressed, dorsal margin with eight to eleven stout spines; middle and posterior legs (fig. 138) terete; tarsal II shortest, I longest.

Sternites: Moderately convex, punctured, more coarsely and closely so laterally; posterior margin of sternites finely denticulate or crenulate.

Terminalia: Male genital capsule opening dorsally, apical rim entire or broadly and shallowly emarginate.

Type of genus.—*Cimex morio* Linnaeus (1761), subsequently designated by Reuter (1888); the several names listed in the synonymy above are accepted on the authority of China (1943).

Distribution.—The widest range occupied by any genus of Cydnidae belongs to *Sehirus*. It has been reported, apparently correctly so, from nearly all major faunal regions. The distribution of the genus within the New World was indicated by specimens as extending from coast to coast across southern Canada and thence south to Florida, Texas, New Mexico, California, and into southern Mexico.

Discussion.—In spite of extensive literature to the contrary, the present study found this genus to be the only truly Old World genus

to have extended its range into this hemisphere, where it is represented by the single species treated below.

In habits the members of this genus are quite different from other cydnids. The species of *Sehirus* are not burrowers and root-feeders, the common trait that suggested the popular name of "burrower bugs" for these insects. Instead, nymphs as well as adults of *Sehirus* feed on plant parts above the ground. This has exposed their activities to observation and enabled students to report more ecological data for them. Although the life history of the single New World species has not been worked out, the reported fragments of it agree well with the biological studies on European species by Boselli (1932), Southwood (1949) and Southwood and Hine (1950). A generalized life cycle has been extracted from the latter paper and incorporated in the family discussion (p. 351) of the present study.

Sehirus cinctus (Palisot de Beauvois)

Plate figures 19, 86, 130, 138, 188

Pentatoma cincta Palisot de Beauvois, 1805, p. 114, pl. 8, fig. 7.

Diagnosis.—This is the only species of the genus known to occur in the Western Hemisphere. The narrow, creamy white margins of pronotum, corium, and abdomen suggested as a ready means of identification of the genus in the New World will serve also to determine this species.

Description.—Color: Brownish black, black, or bluish black, coria usually slightly lighter, narrow side margins of pronotum, costae, edges of sternite II to V, edge of subgenital plate of male, last tergite of female, and elongate dash on dorsal face of each tibia creamy white; antennal II, rostrum, and tarsi yellowish brown.

Male: Oval, broader to posterior of midlength.

Head: Longer than wide; juga reaching or surpassing apex of clypeus, latter slightly narrowed toward apex; margins of juga variously reflexed; surface, except vertex, with numerous close-set, coarse punctures, these more or less confluent into radiating lines toward margins of head; juga ventrally polished, impunctate; maxillary plate distinctly punctured; antennal and labial lengths as given in subspecies descriptions; bucculae reaching nearly to base of head, evanescent posteriorly.

Pronotum: Length less than half of width; transverse impression weak to moderately impressed, marked by a broad band of numerous, distinct punctures continuing finer and sparser over posterior lobe; anterior lobe distinctly and abundantly punctured except on calli; both lobes with minute punctures interspersed between coarser ones.

Scutellum: Longer than wide; surface mostly punctured, more finely so at apex.

Hemelytron: Clavus and corium with numerous, intermixed moderate and minute punctures, the coarser ones arranged in two rows on each side of claval suture; membranal suture straight, slightly recurved laterally; membrane slightly surpassing apex of abdomen, length little greater than basal width.

Propleuron: Punctured; prosternal carinae obsolete.

Mesopleuron (fig. 86): Evaporatorium confined to narrow posterior margin, narrowing laterally, evanescent just before reaching lateral margin of segment; remainder polished, distinctly punctured.

Metapleuron (fig. 86): Osteolar opening ventrally at base of canal between middle and posterior acetabula; evaporatorium just outlining canal; remainder polished, with impressed punctures.

Sternites: Shining, becoming closer and more coarsely punctured laterally; without setigerous tubercles laterad of spiracles.

Terminalia: Subgenital segment distinctly flared marginally, apex entire; gonostylus as illustrated (fig. 188).

Female: Very similar to male, measurements averaging larger (see subspecies descriptions below).

Type data.—Location of type unknown to author. The type locality given by Palisot de Beauvois, "A Agathon, royaume de Benin" in Africa, was apparently in error because Stål (1864) wrote, after examining the type specimen, that the specimen was the common American species described by Say as *Cydnus ligatus*.

Discussion.—The species is known to occur across the southern provinces of Canada from Newfoundland to Alberta, throughout the United States from Maine to Florida and west to California, and in Mexico to the Isthmus of Tehuantepec. The extensive range brings the insect into many types of territories, so it is not surprising to find that some apparent subspeciation is evident. The material studied could be easily divided into three groups on the basis of color and certain intergrading morphological features. One form is northern, occurring across southern Canada and the northern United States; the second occupies most of the United States and Mexico; while the third apparently is restricted to a limited area in the central and eastern part of Texas. With a few specimens at the beginning of this study the conclusions reached were decided and clear cut; the three forms appeared sufficiently distinct to warrant being considered full species. But as additional specimens filled in the geographic gaps they also began bridging the morphological gaps so that conclusions concerning the three required revision downward. The subsequent specimens fitted well into the pattern established by the earlier findings but did indicate overlapping of certain structural features that had been considered of specific value.

The features which show geographic significance are the head, the corial pattern, and the punctures of the sternites. The head shows a progressive shortening in the three forms from the longest condition in the northern one to the shortest in the southwestern form. The northern form has the anteocular length distinctly more than half the anteocular width, 55 (52–57) percent as compared to a comparable ratio of 45 (41–47) percent in the southwestern form. The gap between these figures is bridged by the common southern form, 49 (40–55) percent. In the northern form the obliquely and very strongly elevated jugal margins are higher than the level of the head (fig. 19), which is in contrast to the condition in the other two forms where the juga are much less elevated and are lower than the dorsum of the head. In addition, the dorsum of the head of the southern and southwestern forms are closely punctured to the margins, while in the northern form a broad, marginal band is virtually impunctate.

The corium of the northern and southwestern forms have, in addition to the narrow pale costal margin, a prominent, angulated, creamy white mark at the tip of the radial vein. The southwestern form usually also shows a small, rather inconspicuous, premedian whitish spot on the corium. The southern form lacks these additional pale maculations.

In a series of specimens the southern form appears to have the lateral punctures of the sternites weaker and sparser than the same punctures of the other forms. This character, however, is difficult to evaluate and put into words, so no further use will be made of it in this study.

Key to the subspecies of *Sehirus cinctus*

1. Jugal margins (in profile) elevated above dorsum of head (fig. 19); corium with angled whitish mark at apex of radial vein . **albonotatus** Dallas (p. 359)
   Jugal margins (in profile) lower than dorsum of head; corium with or without whitish mark at apex of radial vein 2
2. Corium with a prominent, angled, whitish mark at apex of radial vein and usually also an inconspicuous premedian pale dot.
   texensis, new subspecies (p. 363)
   Corium with no pale markings as described above.
   cinctus (Palisot de Beauvois) (p. 361)

Sehirus cinctus albonotatus Dallas, new status

Plate figures 1, 19

Sehirus albonotatus Dallas, 1851, p. 127.
Canthophorus cinctus Stål, 1876, p. 22 (part).—Signoret, 1884, p. 60 (part).
Sehirus cinctus Uhler, 1877, p. 297 (part).—Distant, 1880, p. 9 (part).—Lethierry and Severin, 1893, p. 79 (part).—Van Duzee, 1904, p. 26 (part); 1917, p. 24 (part).—Banks, 1910, p. 101 (part).—Torre Bueno, 1939, p. 184 (part).

Diagnosis.—The presence of the angled whitish mark at the apex

of the radial vein plus the elongate head will separate this subspecies from the other two.

Description.—Male:

Head: Wider than long, 1.35(1.23–1.40):1.04(0.96–1.10); anteocular length slightly more than half of anteocular width, 0.52(0.46–0.54): 0.87(0.83–0.96); juga very widely reflexed (fig. 19), margins thickened, virtually impunctate. Antennal segments: I, 0.29(0.29–0.30); II, 0.48(0.38–0.53); III, 0.69(0.60–0.80); IV, 0.85(0.70–0.96); V, 0.98 (0.90–1.06). Labial segments: I, 0.39(0.36–0.42); II, 0.67(0.63–0.70); III, 0.62(0.56–0.66); IV, 0.43(0.40–0.46).

Pronotum: Width more than twice length, 2.85(2.55–3.00):1.28 (1.17–1.36).

Scutellum: Longer than wide, 2.14(1.95–2.21):1.81(1.56–1.89).

Length of body: 5.42(4.72–5.70).

Female: Similar to male but somewhat larger and stouter.

Head: Wider than long, 1.42(1.33–1.51) : 1.14(1.10–1.23); anteocular length more than half of anteocular width, 0.55(0.50–0.60) : 1.00(0.96–1.06). Antennal segments: I, 0.29(0.26–0.33); II, 0.50(0.48–0.53); III, 0.63(0.60–0.70); IV, 0.82(0.76–0.88); V, 0.96(0.88–1.03). Labial segments: I, 0.39(0.36–0.43); II, 0.72(0.70–0.76); III, 0.65(0.53–0.70); IV, 0.50(0.47–0.53).

Pronotum: Width-length ratio, 3.23(2.93–3.52) : 1.50(1.43–1.56).

Scutellum: Length-width ratio, 2.50(2.21–2.66) : 2.05(1.82–2.28).

Length of body: 6.13(5.70–6.45).

Type data.—Two records were given in Dallas' original description, "St. John's Bluff, E. Florida. Presented by E. Doubleday, Esq." and "N. America. From Lieut. Redman's collection." Personal study of the Dallas material (BrM) found only the Florida specimen to be present. As one would expect from the locality, this specimen lacks the apical pale spot on the corium and is *S. cinctus cinctus*. So, in order not to violate Dallas' obvious intent to have this taxon represent a spotted form (both in the description and the name *albonotatus*), it becomes necessary to assume that the missing specimen had the spot and to designate it as the lectotype.

Specimens studied.—82 males, 81 females.

Canada: *Alberta:* Peace River. *Manitoba:* Cedar Lake, Deepdale; July–August. *Newfoundland:* Nicholsville; July. *Ontario:* Port Sidney; July. *Quebec:* Granby, Mattapedia; July-August.

United States: *California:* Meadow Valley (Plumas Co.); June. *Colorado:* Boulder. *Illinois:* Algonquin, Waukon; June–August. *Iowa:* Ames, Boone, Eldora, Little Rock; June–August. *Maine:* Bar Harbor, Eastport, Kingfield, Lovell, Monmouth, Orono, Weld, Westport; April–September. *Massachusetts:* Boston, Humarock, Salem; July. *Michigan:* Cheboygan Co., Chippewa Co., Douglas Lake, Emmet Co.; May–August. *Minnesota:* Pequot Lakes, Traverse Co.; September. *Montana:* Gallatin Co.; May. *New Hampshire:* Bretton Woods,

Franconia, Glen, Mount Washington, Randolph; June–August. *New York:* Buffalo, Catskills, Colden, Cranberry Lake, Greene Co., Hamburg, Keene Valley, Murray Bay, New York, North Elba, Paradox, Westport; June–September. *North Dakota:* Fargo, Mankinsen; July–September. *Pennsylvania:* Germania; July. *Vermont:* Grand Isle, Jay; July. *Wisconsin:* Belle Plain, Winnebago Co.; July. *Wyoming:* Gurney; July.

Discussion.—This subspieces ranges across the provinces of southern Canada from Newfoundland to Alberta and in the northern United States as far south as New York, Michigan, northern Illinois, central Iowa, Wyoming, and northern California. This southern limit of range roughly approximates north latitude 41°.

The reported habits of this subspecies differ in no important respects from the life histories that have been worked out for European species. The present form hibernates as an adult (Parshley, 1923), feeds on labiate plants in the young stages (Van Duzee, 1905), and, as imago, has a variety of feeding tastes, adults having been reported from various plants, especially Scrophulariaceae (Provancher, 1886), from wild raspberries (Parshley, 1923) and from Compositae, Cyperaceae, and Graminae (Hendrickson, 1930). It appears to be adaptive to a variety of habitats, as indicated above, and by reports that it has also been taken under boreal conditions on the summit of Mount Greylock at some 3,500 feet elevation (Parshley, 1920). One report (Torre Bueno, 1915) said that even this species has the ability to burrow "into the sand for shelter."

Sehirus cinctus cinctus (Palisot de Beauvois)

Plate figures 86, 130, 138, 188

Pentatoma cincta Palisot de Beauvois, 1805, p. 114, pl. 8, fig. 7.
Cydnus ligatus Say, 1831, p. 10.
Sehirus cinctus Amyot and Serville, 1843, p. 97.—Stål, 1864, p. 29 (corrects type locality to America).—Walker, 1867, p. 169 (uses erroneous African type locality).—Uhler, 1876, p. 281 (part).—Distant, 1880, p. 9 (part).—Lethierry and Severin, 1893, p. 79 (part).—Van Duzee, 1904, p. 26 (part); 1917, vol. 2, p. 24 (part).—Banks, 1910, p. 101 (part).—Torre Bueno, 1939, p. 184 (part).
Canthophorus cinctus Stål, 1876, p. 22 (part).— Signoret, 1884, p. 60 (part).

Diagnosis.—The lack of pale spots on the corium appears sufficiently diagnostic for the recognition of this subspecies.

Description.—Male:

Head: Wider than long, 1.12(1.03–1.20):0.88(0.80–0.93); anteocular length averaging just about half (49 percent) of anteocular width, 0.36(0.33–0.40):0.73(0.68–0.76); juga narrowly reflexed, margins acute, punctured nearly or quite to edge. Antennal segments: I, 0.22(0.20–0.23); II, 0.38(0.36–0.40); III, 0.47(0.43–0.53); IV, 0.65(0.63–0.71); V, 0.84(0.80–0.93). Labial segments: I, 0.33(0.30–0.36); II, 0.57(0.54–0.60); III, 0.57(0.53–0.60); IV, 0.40(0.40–0.40).

Pronotum: Width more than twice length, 2.45(2.21–2.60):1.13 (0.97–1.17).

Scutellum: Longer than wide, 1.82(1.52–1.95):1.48(1.30–1.60).

Length of body: 4.55(4.05–4.80).

FEMALE.—Similar to male, averaging somewhat larger and stouter.

Head: Wider than long, 1.19(1.13–1.30):0.86(0.80–0.96); anteocular length averaging about half (49 percent) anteocular width, 0.41(0.40–0.43):0.83(0.76–1.00). Antennal segments: I, 0.23(0.23–0.26); II, 0.40(0.36–0.44); III, 0.50(0.46–0.60); IV, 0.67(0.60–0.80); V, 0.87(0.83–0.98). Labial segments: I, 0.34(0.33–0.36); II, 0.59 (0.54–0.66); III, 0.61(0.60–0.66); IV, 0.43(0.40.0.50).

Pronotum: Width more than twice length, 2.71(2.34–3.13):1.23 (1.04–1.36).

Scutellum: Longer than wide, 2.14(1.89–2.47):1.72(1.49–2.02).

Length of body: 5.23(4.65–5.92).

TYPE DATA.—Location unknown to the author. Palisot de Beauvois originally gave the type locality as "A Agathon, royaume de Benin" in Africa. Stål (1864), after examining the type, wrote that the African locality was in error because this was the common American species described by Say as *Cydnus ligatus*. All authors except Walker (1867) have recognized and accepted Stål's correction. The type locality given in Say's original description was "United States."

SPECIMENS STUDIED—35 males, 58 females.

UNITED STATES: *Alabama:* Coatopa, Gadsden; May–July. *District of Columbia:* April–June. *Florida:* Key Largo, Monticello, Tallulah; January, March, July. *Georgia:* Peach Co.; May. *Iowa:* Ames, Clarinda, Farragut, Gilbert, Iowa City, Muscatine, Shenandoah; March–August. *Illinois:* Algonquin, Belvidere, Cairo, Chicago, East Cape Girardeau, Glen Carbon, Havana, Peoria, Urbana; April–September. *Kansas:* Cowley Co., Douglas Co., Lawrence, Marion Co., Miami Co.; June–October. *Kentucky*: Henderson Co., Mason Co.; June–September. *Louisiana:* Baton Rouge; April–June. *Maryland:* Baltimore. *Massachusetts:* Boston. *Michigan:* Ann Arbor, Detroit, Livingston Co., Monroe Co., Oakland Co., Washtenaw Co.; May–August. *Mississippi:* State College; June–August. *Missouri:* Aldrich, Barry Co., Glencoe, Hayti, Kansas City, Kinsey, Platte City, St. Louis, Sarcoxie, Wyatt; May–August. *Nebraska:* Grand Island; July. *New Mexico:* Ruidoso; June. *New York:* Geneva, Ithaca, Onandago Co., White Plains; April–June. *North Carolina:* Black Mts., Raleigh; March–July. *Oklahoma:* Quinton; June. *Ohio:* Columbus; April, August. *Pennsylvania:* Jeanette, Philadelphia. *South Carolina:* Clemson; August. *Tennessee:* Clarksville, Knoxville, Lawrenceburg; April–August. *Texas:* Alpine, Austin, Brownsville, Cisco, College Station, Cowley, Crosby, Dallas, Kerrville, Lonview, Palm Grove, San Antonio, Sanderson, San Jacinto; February–July. *Virginia:* Arlington, Charlottesville, Fairfax, Falls Church, Nelson Co., Shenandoah; April–August. *Wisconsin:* Broadhead; June.

MEXICO: *Distrito Federal:* Chapultepec, Ciudad de México; July. *Guerrero:* Río Balsas. *Jalisco:* Puente Grande; July. *Michoacán:* Zitacuaro; July. *San Luis Potosí:* Tamazunchale; June. *Other Mexican localities:* Tomás, San José; April. Real de Arriba Temescaltepec; July.

Discussion.—The original description and its accompanying illustration both call attention to the whitish lateral margins of the pronotum and corium. In addition, the illustration shows the elongate pale marks on the dorsal faces of the tibiae and shows the corium to be without the angled pale spot at the apex of the radial vein of the corium. Thus the name *cinctus* of Palisot de Beauvois can apply only to the present form. Say's description of *Cydnus ligatus* is equally detailed in describing the pale markings that are present and in pointing out that the pale corial maculations, other than the costal margin, are lacking. Thus his species also can apply only to this form and so must be considered a synonym of *cinctus*, which was described 26 years earlier.

As is the case with subspecies *albonotatus*, the above-ground habits of this form have permitted observational access to parts of the life history of *cinctus cinctus*. The same general type of life history is evident with overwintering adults (Hart, 1919) possibly breeding on labiates and adults frequenting a variety of plants—sweet clover, *Stachys* sp., *Monarda punctata* (Hart, 1919); raspberry (Froeschner, 1941); raspberry, wild cherry, and grasses (Blatchley, 1926).

Sehirus cinctus texensis, new subspecies

Diagnosis.—The creamy white dot at the apex of the radial vein of the corium plus the shorter head (anteocular length less than half of anteocular width) will quickly separate this subspecies from the other two.

Description.—Male:

Head: Wider than long, 1.14(1.10–1.16):0.87(0.86–0.90); anteocular length little less than half of anteocular width, 0.34(0.33–0.36): 0.75(0.73–0.76); juga narrowly and lowly reflexed, punctured nearly or quite to edge. Antennal segments: I, 0.23(0.23–0.24); II, 0.38 (0.36–0.40); III, 0.47(0.46–0.50); IV, 0.63(0.63–0.66); V, 0.74(0.73–0.76). Labial segments: I, 0.31(0.30–0.33); II, 0.56(0.53–0.60); III, 0.50(0.50–0.53); IV, 0.33(0.33–0.36).

Pronotum: Width more than twice length, 2.47(2.35–2.53):1.10 (1.04–1.17).

Scutellum: Longer than wide, 1.83(1.75–1.89):1.58(1.49–1.62).

Length of body: 4.72(4.35–4.95).

Female: Similar to male, averaging somewhat larger.

Head: Wider than long, 1.26(1.20–1.36):0.93(0.80–1.06); anteocular length averaging less than half (45 percent) of anteocular width, 0.40(0.40–0.43):0.88(0.83–0.96). Antennal segments: I, 0.25 (0.23–0.28); II, 0.40(0.36–0.46); III, 0.45(0.43–0.47); IV, 0.61(0.56–0.66); V, 0.71(0.70–0.76). Labial segments: I, 0.38(0.33–0.46); II, 0.61(0.53–0.76); III, 0.61(0.53–0.76); IV, 0.43(0.36–0.50).

Pronotum: Width more than twice length, 2.90(2.79–3.06):1.26 (1.20–1.30).

Scutellum: Longer than wide, 2.23(2.08–2.40):1.85(1.75–1.95).

Length of body: 5.20(4.95–5.70).

Type data.—Holotype male (USNM 64426). Victoria, Tex., Dec. 16, 1915, J. D. Mitchell, hibernating in sedge grass. Allotype female (USNM), same locality and collector, May 19, 1907. Paratypes as follows:

United States: *Texas:* Austin, June 19, 1930, 1 male (RLU); April 9–24, J. O. Martin, 1 female (CalAc). Brazos Co., 2 males, 5 females (MCZ, RCF); May 2, 1950, R. F. Smith, 2 females (CIS). College Station, June 7, 1931, Mills, 1 female (HMH). Concan, July 6, 1936, D. R. Lindsay, nymph (CalAc); Cypress Mills, Chittenden, 2 females (USNM, RCF). Kerryville, May 27, 1907, J. D. Mitchell, 1 female (USNM). San Antonio, June 1942, E. S. Ross, 1 female (CalAc); Tiger Mills, May 10, Schaupp, 13 females (MCZ, RCF). Uvalde, June 12, 1930, G. Linsley, 1 female (CalAc).

Discussion.—Although this form is treated here as a subspecies because of the limited range (southeastern Texas) and great similarity to the more common form within whose range it occurs, there is some possibility that it may more properly be considered a full species. It is an established form which, in spite of the very limited extent of its range, is sympatric with another form, *S. cinctus cinctus.* However, except for the color pattern of the corium, the two forms blend in a clinal series that at present defies morphological separation. Perhaps additional studies coupled with application of statistics will show them as sibling species. Before this can be done reliably, however, large series from several populations must be made available; too many of the specimens at hand for both this and related forms were single representations of collections.

Garsauriinae, new subfamily

Plate figures 65, 88, 169, 174

Diagnosis.—The fact that tarsal II is distinctly thinner than either I or III, coupled with antennal II being much less than half as long as antennal I, will set this subfamily apart from all others within the family. The trichobothrial arrangement (fig. 174) and venational pattern in the hind wing (fig. 169) are likewise each unique within the family.

Description.—Head: Length little more than half of width; antennae 5-segmented; labium short, reaching base of mesosternum, II without semicircular foliaceous lobe.

Wings: Three widely spaced veins leaving apex of radial cell, median vein with thick, wide, blunt process projecting into radial cell at midlength (fig. 169).

Scutellum.—Surpassing apices of clavi, latter not forming a commissure beyond apex of scutellum.

Thoracic pleurae (fig. 88): Posterior margins fully developed; propleuron with anterior and posterior convexities.

Legs: Not especially modified; tarsi with segment II thinner than I or III; anterior tarsus inserted at apex of tibia.

Sternites: Sutures faintly crenulate, curved anteriorly in middle third; sternites III to VII with two trichobothria arranged in horizontal rows posterior to the spiracles (fig. 174).

Type of subfamily.—Genus *Garsauria* Walker (1868, p. 536), of which *Microhynchus* Signoret (1882, p. lxiii), *Microrrhamphus* Bergroth (1891, p. 214), and *Brachyrrhamphus* Haglund (1894, p. 400) are all established synonyms.

Distribution.—Literature records show the range of this group to extend from the Malay Archipelago eastward across southern Asia into Africa.

Discussion.—At present, this subfamily consists of the single genus *Garsauria* Walker with the genotype *G. aradoides* fixed by the monobasic original proposal. In addition, there are four other species that have been proposed under this generic name. All of these are extralimital to the present study and so will not be considered further here.

Scaptocorinae, new subfamily

Diagnosis.—The peculiar cultrate anterior tibia with the tarsus inserted at its midlength (fig. 115) will separate this subfamily from all others in the Cydnidae.

Description.—Head: Subquadrate; lateral margins with oblique crenulations (fig. 20); antennae 4-segmented.

Scutellum: Long, surpassing apices of clavi, latter not forming a commissure posterior to scutellar apex.

Wings: Venation of posterior wings (fig. 165) with Sc and R leaving radial cell at antero-apical angle, juncture of r-m and M basad of fracture in Sc+R, radial cell receiving short hamus from M.

Thoracic pleurae (fig. 85): Posterior margins not fully developed; propleuron with no posterior convexity; mesopleuron shrunken posteriorly, hind margin concave, exposing mesometapleural membrane for most of its width; metapleuron shrunken posteriorly, reaching base of abdomen laterally, thence inwardly curving anteriorly and partly exposing internal portion of posterior coxa.

Legs: Strongly modified; anterior tibia (fig. 115) depressed, strongly cultrate, greatly projecting beyond tarsal insertion so that tarsus arises at its midlength, without a dorsal row of spines; middle legs (fig. 133) obliquely impressed, dorsally distinctly curved, with rows of stout bristles, these absent on ventral face, tarsal insertion subapical;

hind femora (figs. 136, 137) greatly swollen, hind tibia heavily club-shaped, apex obliquely truncated and surrounded by a row of stout denticles; tarsi present on front, middle, and sometimes (*Stibaropus*) hind legs, segment II subequal in diameter to I and III.

Sternites: Sutures strongly sinuate or emarginate at level of ventral trichobothrium; sternites III–VII each with two trichobothria (fig. 170), a small one posterior to spiracle and a much larger one antero-ventral to spiracle.

Terminalia: Male genital capsule (fig. 178) opening posteriorly; female terminalia (fig. 187) deflexed so that ventral plates are concealed by sternite VII.

Type of subfamily.—Genus *Scaptocoris* Perty (1830, p. 165).

Distribution.—The distribution of this subfamily is that of its two included genera, *Scaptocoris* and *Stibaropus*. *Scaptocoris* is restricted to the Neotropical Region, where it is represented by not more more than a half dozen known species; the similar number of species of *Stibaropus* appear confined chiefly to the Oriental Region with one species ranging westward through Asia Minor into southeastern Europe, and so are extralimital to this study.

Discussion.—In addition to the definitive characters given above, the members of the Scaptocorinae have a unique facies due to the very strongly convex form. Of the above-enumerated features the arrangement of the trichobothria, the shape of the sternal sutures, the venation of the hind wing, and the elongated scutellum may be considered fundamental or of phylogenetic significance. These, plus the numerous other characters which are of a highly adaptive nature, point to the group as a very specialized one. Together they emphasize that the evolutionary path followed by its members is separate and well removed from that traveled by other Cydnidae.

The biology of the Scaptocorinae is very poorly known, but what few facts are available will be treated under the species headings below.

Scaptocoris and *Stibaropus*, although so widely separated geographically, are very closely allied, causing one to be more impressed by their similarities than their differences. But to separate the two is a relatively easy matter if one has recourse to the second labial; in *Stibaropus* it is simple, while in *Scaptocoris* it bears a strongly foliaceous, semicircular lobe which is often hidden between the anterior coxae.

Genus *Scaptocoris* Perty

Scaptocoris Perty, 1830, p. 165.

Diagnosis.—This genus, the only member of its subfamily in the Western Hemisphere, may be recognized by any of the features mentioned in the subfamily treatment above. The peculiar club-

shaped posterior tibiae offer the most readily available means of identification.

Description.—Short, compact, strongly convex dorsally and ventrally; widest posterior to midlength of body.

Head (figs. 20, 51): Little wider than long, anterior two-thirds strongly declivent; margin of jugum crenulate with a series of oblique, overlapping crenulations with a single cilium between, without a submarginal row of spines or cilia; eyes prominent, strongly projecting; ocelli well developed, situated behind a line connecting posterior margins of eyes; clypeus as long as or longer than jugum; antennae 4-segmented, IV thickest; bucculae vestigial or absent, maxillary plate with a tuft of long cilia near their site; labium short, arising posterior to apex of head, not or only slightly surpassing anterior coxae, II thickest, with a large, foliaceous, semicircular lobe which is often hidden between anterior coxae.

Pronotum: Distinctly broader than long, narrowed anteriorly, all angles and lateral margins broadly rounded; lateral margins carinate, strongly deflexed with a submarginal row of 12 to 20 setigerous punctures; transverse impression weak or absent; posterior lobe longer than anterior lobe and with wide, transverse rugae which are sometimes punctured.

Scutellum: Longer than broad; sculptured similarly to posterior lobe of pronotum; apex expanded, broadly rounded, wider than half of membranal suture.

Hemelytron: Corial areas usually well defined; membranal suture distinctly sinuate on medial half; membrane hyaline to slightly milky, not more than two-fifths of hemelytral length, usually distinctly surpassing apex of abdomen.

Propleuron: Strongly convex anterior to depression, impunctate; evaporatorium restricted to posterior part of segment; mesosternum carinate medially, with numerous long hairs.

Metapleuron: Slightly convex, impunctate; osteole opening posteriorly under reduced peritreme surrounded by extensive evaporatorium.

Legs: Short and stout; anterior femora stout, thick, height about one-half length, anterior tibiae strongly depressed, cultrate, prolonged beyond tarsal insertion by more than one-third its length; tarsi very slender, length more than half of tibia; II shortest, subequal in diameter to I and III; middle femora not much swollen; middle tibiae somewhat clavate, curved, ciliate, slightly projecting beyond tarsal insertion; length of middle tarsus about one-third of tibia; posterior femora very strongly swollen, convex dorsally; posterior tibiae stoutly

club-shaped, apex obliquely truncated, with U-shaped corbicle; tarsi absent.[6]

Sternites: Strongly convex, densely long-haired subapically.

Terminalia: See subfamily treatment.

Color: All species are some shade of tan or brown; no piceous or black forms are known.

Nymphs: The half dozen nymphs available during this study were third, fourth, and fifth instars of *divergens*, new species, and *talpa*. They showed the head and leg structure of the adults and indicated that the nymphs of this genus may be readily recognized by these same peculiar modifications.

Type of genus.—*Scaptocoris castanea* Perty (1830, p. 166), monobasic.

Distribution.—Restricted to the Neotropical Region where it has been reported as far north as Mexico and Cuba and south on the South American continent to northern Argentina.

Discussion.—The few notes that have been published on the biology of the species of this genus indicate they are root feeders as adults and nymphs (Champion, 1900; Carvalho, 1952) and of some agricultural importance (Champion, 1900; Costa Lima, 1940).

Some specimens exhibited severe wear in the form of nearly or quite complete obliteration of the lateral crenulations and dorsal rugae of the head and a marked shortening of the front tibia, which apparently are stabbed into the earth in digging.

In 1847 Schiödte also described as new in this genus the following four species: *molginus* (p. 458), *tabulatus* (p. 459), *callidus* (p. 460) and *terginus* (p. 460). The first three of these were described from India and correctly assigned to *Stibaropus* by Stål (1876, p. 17). *S. terginus* was described from the Colsman collection as being unlabelled but in a box containing specimens supposed to have come from Brazil; however, Schiödte himself wrote that the accuracy of this label was not beyond question. Personal examination of the type (Copen) of *terginus* showed it to be a true *Stibaropus* (with a simple second labial segment and the posterior tarsi present) and of the same species as the type of *callidus*. Therefore, the label for Brazil must be in error and the name is no longer available for any species of the Western Hemisphere.

The nomenclature within the genus has been further confused by an uncertainty of application of Perty's name *castaneus*. His description and illustration (if the delineation of the hind tarsi is ignored)

[6] In the original description Perty wrote of the hind tarsi, "tarsis nullis," but in error showed them as present in the illustration. Blanchard (1840) pointed out the error in the figure. Signoret (1881b) objected to considering the posterior tarsi absent and wrote of them as being present and "tres petits, insertes a l'extremite superieure de la troncature." Champion (1900) reported that he was unable to find tarsi on any of the specimens before him. The present study found all pits and punctures of the hind tibiae occupied by short, decumbent spines, and that no point for tarsal attachment exists. Thus, there appears to be no reason to disagree with the original statement, "tarsis nullis" as Signoret has done.

are excellent for assignment to the genus but insufficient for determining which of the six currently recognized species is to bear the name. I have examined the type of *castaneus* Perty, which is still in good condition in the Zoologisches Museum in Munich. The type is the species that Signoret considered to be *terginus*. His "*castaneus*" is thus without a name, and it is described below as a new species.

Key to the known species of *Scaptocoris*

1. Corbicle of posterior tibia crowded with numerous coarse, transverse tubercles arranged in rows which extend almost to base of tibia (fig. 136).
   giselleae Carvalho (p. 371)

   Corbicle of posterior tibia mostly smooth, with few tubercles (fig. 134) . 2
2. Clypeus distinctly surpassing apices of juga and broadly expanded anterior to them (fig. 51) . . . . **divergens,** new species (p. 369)

   Clypeus not or only slightly surpassing juga, not distinctly expanded anterior to them 3
3. Eyes broadly transverse, width of one of them equal to or greater than a third of interocular width; pronotum with distinct punctures on and in transverse sculpturing . . . . **minor** Berg (p. 372)

   Eyes not so broad, width of one of them less (usually distinctly less) than a third of interocular width; pronotum with or without punctures . . . 4
4. Corbicle with discal tubercles in an irregular, single row very close to and paralleling outer edge of corbicle (fig. 134); pronotal rugae distinctly punctured, at least in region of transverse impression.
   talpa Champion (p. 374)

   Corbicle with discal tubercles not in an irregular row close to outer edge or corbicle (fig. 135); pronotal rugae impunctate or feebly punctate 5
5. Size larger, length of body 10.1 mm; color dark reddish brown.
   grossa, new species (p. 373)

   Size smaller, length of body 5.1–7.2 mm; color yellowish tan.
   castanea Perty (p. 375)

Scaptocoris divergens, new species

PLATE FIGURES 3, 20, 51, 85, 115, 133, 137, 165, 170, 178, 187, 189

Scaptocoris castaneus (not of Perty) Signoret, 1881b, p. 41, pl. 11, fig. 50.—Lethierry and Severin, 1893, p. 60 (part).

Scaptocoris terginus (not of Schiodte) Berg, 1884, p. 11 (part).—Uhler, 1886, p. 3.—Torre Bueno, 1914, p. 162 (part).—Barber and Bruner, 1932, p. 235.—Martorell, 1939, p. 186.

DIAGNOSIS.—The prolonged and strongly expanded clypeus (fig. 51) will separate adults and nymphs of this species from others in the genus.

DESCRIPTION.—Color: Yellow-brown, apices of anterior tibiae and sometimes marginal spines of corbicles of posterior tibiae fuscous or black.

MALE: Based on two specimens.

Head (fig. 3): Wider than long, 1.61(1.60–1.63):1.50(1.49–1.51); interocular width, 1.04(1.03–1.06); ocellus large, separated from eye

by less than transverse ocellar width; juga weakly convex, shorter than clypeus, latter diverging from base, very wide at apex. Antennal segments: I, 0.59(0.58–0.61); II, 0.48(0.46–0.50); III, 0.43 (0.43–0.43); IV, 0.54(0.53–0.56). Labial segments: I, 0.53(0.53–0.54); II, 0.52(0.50–0.55); III, 0.43(0.42–0.44); IV, 0.37(0.36–0.38).

Pronotum: Length about three-fifths width, 2.64(2.63–2.66):4.33 (4.30–4.36); posterior lobe impunctate.

Scutellum: Longer than wide, 3.43 (3.42–3.45):2.67(2.65–2.69); impunctuate.

Hemelytron: Polished, obsoletely or not punctate.

Legs: Corbicle of posterior tibia with single, submedian row of tubercles on dorsal half.

Terminalia: Gonostylus as illustrated (fig. 189).

Length of body: 7.47(7.44–7.50).

Female.—Very similar to male.

Head: Width-length ratio, 1.65(1.58–1.72):1.49(1.40–1.60); interocular width, 1.11(1.00–1.16). Antennal segments: I, 0.66(0.60–0.73); II, 0.50(0.46–0.55); III, 0.49(0.43–0.56); IV, 0.59(0.56–0.60). Labial segments: I, 0.53(0.46–0.60); II, 0.57(0.50–0.63); III, 0.40 (0.34–0.43); IV, 0.36(0.33–0.43).

Pronotum: Length-width ratio, 2.72(2.55–2.92):4.54(4.25–4.80).

Scutellum: Length-width ratio, 3.54(3.15–3.90):2.92(2.85–3.07).

Length of body: 7.68(7.05–8.25).

Type data.—Holotype male (USNM 64869), "Rio Frio, Colombia, 5–24–25." Allotype female (USNM) same data. Paratypes as follows:

Guatemala: "Guat.," 1 male, 3 females (USNM).

Honduras: La Lima, August 26, 1959, 2 males (USNM). Guarama, Department of Cortes, Dec. 19, 1956, in soil around roots of banana, 10–24 inches down, 1 female (USNM).

Panama Canal Zone: Fort Clayton, June 25, 1945, K. E. Frick, 1 female (CalAc). Madden Dam, May 18, 1936, M. M. Saylor, 2 females (RLU).

Colombia: Same data as types, 16 females (USNM, RCF). Same locality as type, May 26, 1925, 2 males, 34 females (USNM, RCF). Some of these were determined as *Scaptocoris castaneus* by McAtee and Malloch. Same locality as types, May 20, 1930, Darlington, 1 female (MCZ).

Venezuela: Boquerin, Yaracuy, Mar. 20, 1920, J. and E. B. Williamson, 2 females (MCZ). Caracas Valley, Los Ruisses, May 1926, H. E. Box, 11 females (BrM). La Fria, Tachira, Apr. 19, 1920, J. and E. B. Williamson, 2 males (MCZ, RCF).

Trinidad: "Trinidad, W. I., Jun.," 1 female (USNM).

Distribution.—Specimens studied indicate that the range of this species extends from Panama to northern South America and some of the adjacent islands—Colombia and Venezuela on the continent and Trinidad just off the shore.

Discussion.—This is the species treated as *castaneus* Perty by Signoret. However, examination of Perty's type shows that the name

belongs to a more southern species and leaves the present one without a name. The name proposed above is in reference to the strongly divergent clypeal margins. The numerous illustrations used as characteristic of the genus in this paper are the result of following Signoret's definition of the species and considering, admittedly in error, that this was the type of the genus. However, no serious problems should arise if this is duly noted.

Since *divergens* is the only species of the genus known to occur far enough north to reach Cuba, Martorell's (1939, p. 186) notes on *terginus* on that island probably pertain to it. These notes include several interesting biological facts on the species and are quoted as follows:

> This insect becomes a real menace during the rainy nights at La Providence. It is the favorite food of the toad, *Bufo marinus* L., during this season. About 90% of the stomach contents of toads, during the time that these insects were abundant, consists of *S. terginus*, according to dissections made by the writer. The toads do not seem to mind the repugnant odor of these bugs. During the first hours of the evening, when the bright lights inside of the School of Agriculture were turned on, these insects would come in great numbers, attracted to the lights.

Scaptocoris giselleae Carvalho

PLATE FIGURE 136

Scaptocoris giselleae Carvalho, 1952, p. 1.

DIAGNOSIS.—The presence of numerous rows of close-set tubercles that fill the corbicle and extend irregularly to the base of the posterior tibia will easily separate this species from all others in the genus.

DESCRIPTION.—Based on one female.

FEMALE: Head: Wider than long, 1.75 : 1.63; interocular width, 1.33; width of eye, 0.21; ocellus small, separated from eye by a space 1½ times ocellar width; juga weakly convex, almost as long as tylus, latter diverging slightly from base to apex. Antennal segments: I, 0.60; II, 0.63; III, 0.43; IV, 0.60. Labial segments: I, 0.60; II, 0.66; III, 0.46; IV, 0.38.

Pronotum: Length-width ratio, 2.70 : 4.65; posterior lobe with numerous, scattered, fine, fuscous punctures.

Scutellum: Length-width ratio, 3.81 : 3.15; with a few fine punctures toward sides similar to pronotum.

Hemelytron: Polished, with scattered fine punctures, those of exocorium colored like those on pronotum; membrane yellowed, very short, reaching almost to apex of penultimate tergite.

Legs: Posterior tibia with corbicle and dorsal surface crowded with rows of close-set tubercles (fig. 136).

Color: Light brown, apices of anterior tibiae slightly darker.

Length of body: 8.40.

Type data.—Holotype is in the Museu Nacional do Rio de Janeiro. Carvalho listed the type locality as Sernambetiba, Distrito Federal, Brazil.

Specimens studied: 1 female.

Brazil: São Paulo, A. A. Barbiellini, 1 female (USNM).

Discussion.—*S. giselleae* is quite distinct within the genus on several characters: The numerous tubercles on the hind tibia, the very short wing membrane which falls short of the apex of the abdomen, and the small ocelli which are separated from the nearest eye by a space distinctly more than the transverse diameter of an ocellus.

With his original description of this species Carvalho reported that the type material was collected on July 7, 1951,

> by Miss Giselle Machilne who collected them when digging between a type of vegetation dominated by *Diplothemium maritimum* Martuis, a dwarf palm and a prairie type of vegetation. There were collected altogether 15 specimens in different phases of development, about one hundred meters from the tide line and two meters below the surface of the soil. The bugs were probably feeding on the roots of *Telanthera maritima* Moq. since they were found around a gall of about the size of a human wrist. A strong odor was noted when handling them.

Scaptocoris minor Berg

Plate figure 190

Scaptocoris minor Berg, 1894, vol. 1, p. 14.

Diagnosis.—The very broad eyes (one of which equals or exceeds one-third of the interocular width) separate this species from others within the genus.

Description.—Color: Light brown to brown, apices of anterior tibiae and marginal tubercles of corbicle of posterior tibiae fuscous to black.

Male: Head: Wider than long, 1.67(1.63–1.72): 1.37(1.33–1.43); interocular width, 0.96(0.86–1.00); width of eye, 0.36(0.34–0.38); ocellus large, separated from eye by less than ocellar width; clypeus narrow, parallel-sided, reaching or slightly surpassing apices of juga. Antennal segments: I, 0.40(0.40–0.43); II, 0.42(0.40–0.46); III, 0.43 (0.40–0.50); IV, 0.62(0.60–0.66). Labial segments: I, 0.49(0.46–0.56); II, 0.56(0.53–0.63); III, 0.36(0.33–0.40); IV, 0.35(0.33–0.36).

Pronotum: Length-width ratio, 2.39(2.10–2.63): 3.97(3.63–4.20); transverse rugae distinctly punctured.

Scutellum: Length-width ratio, 3.28(3.11–3.43): 2.50(2.25–2.75); surface more or less distinctly punctured.

Hemelytron: Corium polished, with numerous, fine to moderate punctures; membrane surpassing apex of abdomen by more than half its length.

Legs: Corbicle of hind tibia with a double, irregular row of tubercles on outer half.

Terminalia: Gonostylus as illustrated (fig. 190).

Length of body: 6.79(6.00–7.42).

FEMALE: Very similar to male, measurements more variable.

Head: Width-length ratio, 1.65(1.54–1.86):1.39(1.30–1.50); interocular width, 0.94(0.86–1.03); width of eye, 0.36(0.32–0.41). Antennal segments: I, 0.36(0.33–0.43); II, 0.42(0.34–0.53); III, 0.38(0.36–0.40); IV, 0.30(0.28–0.33). Labial segments: I, 0.48(0.40–0.56); II, 0.55(0.45–0.63); III, 0.36(0.33–0.40); IV, 0.30(0.28–0.33).

Pronotum: Length-width ratio, 2.30(1.84–2.66):3.84(3.18–4.45).

Scutellum: Length-width ratio, 3.26(2.84–3.70):2.35(2.05–2.73).

Length of body: 6.50(5.40–7.56).

TYPE DATA.—In Museo Argentina de Ciencias Naturales (formerly Museo Nacional de Buenos Aires), Buenos Aires, Argentina, fide correspondence from Kormilev. The publication containing the original description was not available during this study. The data from the type specimen, as furnished by Kormilev, gives the locality as Matto Grosso, Brazil.

SPECIMENS STUDIED: 10 males, 19 females.

BRAZIL: Amazon River, Arary to Manoas, Sept. 20–21, 1930, Holt, Blake, and Agostini, 1 male (USNM); Parintine, August 1935, G. V. Vredenburg, 2 males, 4 females (BrM); Bahia, Dec. 6, 1907, 1 male, 4 females (Car); Taperapes, Aracuayes, Matto Grosso, J. Carvalho, 2 females (CMC).

PERU: Puerto Maldanado, Madre de Díos, Apr. 17, 1947, alt. 600 ft., J. C. Pallister, 6 males, 8 females (AmM).

VENEZUELA: Samariapo, Amazonas, June 12, 1950, J. M. Capriles, 1 female (Cap).

Scaptocoris grossa, new species

DIAGNOSIS.—The large size and impunctate posterior lobe of the pronotum distinguish this new species from its congenitors.

DESCRIPTION.—Based on four females, one too badly eaten by dermestids to yield measurements.

HEAD: Wider than long, 2.39(2.30–2.47):2.06(2.02–2.08); interocular width, 1.52(1.46–1.56); width of eye, 0.43(0.42–0.45); ocellus large, separated from eye by less than an ocellar width; clypeus parallel-sided, subequal to length of juga. Antennal segments: I, 0.73(0.70–0.73); II, 0.82(0.80–0.83); III, IV, and V missing in all specimens seen. Labial segments: I, 0.71(0.70–0.73); II, 0.85(0.83–0.88); III, 0.57(0.56–0.60); IV, 0.54(0.53–0.56).

Pronotum: Length-width ratio, 3.67(3.57–3.75):6.22(6.15–6.31); posterior lobe impunctate.

Scutellum: Length-width ratio, 4.72(4.65–4.80):3.99(3.90–4.05); impunctate.

Hemelytron: Polished, virtually impunctate or with obsolete punctures; membrane hyaline, surpassing apex of abdomen by about one-third its length.

Legs: Corbicle of posterior tibia with discal tubercles few in number, well removed from outer margin.

Color: Dark brown, apical half or more of anterior tibiae and marginal tubercles of corbicle of posterior tibiae black.

Length of body: 10.65 in all specimens.

TYPE DATA.—Holotype female (KU), "Peru, S.A., 4–21, 1939, F. Woytkowski, No. 398, Dept. Huanuco, Loc. Shapajilla, 630 m.a.s., 1.11 km. N. E. Tingo Maria." Paratypes as follows:

PERU: Same data as type, 2 females (RCF, USNM).
BOLIVIA: Yungas de Coroico, Fassel, 1 female (Wien).

DISTRIBUTION.—This species is known only from Bolivia and Peru, as indicated above.

DISCUSSION.—Although known only from a few female specimens, the present species must be erected because the specimens agree with none of the previously described forms. The four specimens are very uniform in appearance and stand out more boldly in general habitus than is borne out by structural features. In its large size and dark color, this species appears superficially most like *talpa*, but the impunctate posterior lobe of the pronotum and the irregularly placed discal tubercles of the corbicle that are distinctly removed from the side of the corbicle will separate it effectively from *talpa*.

Scaptocoris talpa Champion

PLATE FIGURES 134, 191

Scaptocoris talpa Champion, 1900, p. 256.

DIAGNOSIS.—The location of the single row of transverse tubercles very close to the outer edge of the corbicular area of hind tibia (fig. 134) and large size (over 8.5) separates this species readily from all others in the genus.

DESCRIPTION.—COLOR: Light brown, apices of anterior tibiae and marginal and discal tubercles of corbicle of posterior tibia fuscous to black.

MALE: Two specimens.

Head: Wider than long, 1.94(1.93–1.95):1.65(1.62–1.69); interocular width, 1.31(1.30–1.33); width of eye, 0.32 in both specimens; ocellus large, separated from eye by less than ocellar width; clypeus subparallel-sided, subequal to length of juga. Antennal segments: I, 0.70(0.70–0.70); II, 0.65(0.65–0.66); III, 0.44(0.43–0.46); IV, 0.40(0.38–0.42). Labial segments: I, 0.65(0.65–0.66); II, 0.68(0.66–0.70); III, 0.44(0.43–0.46); IV, 0.40(0.38–0.42).

Pronotum: Length-width ratio, 3.18(3.15–3.22):5.17(5.10–5.25); posterior lobe with distinct, fine punctures.

Scutellum: Length-width ratio: 4.12(4.05–4.20):3.18(3.15–3.22); with few, scattered, fine punctures.

Hemelytron: Shining, with small, distinct punctures; membrane surpassing apex of abdomen by about one-third its length.

Legs: Discal tubercles of hind tibial corbicle arranged in a single, irregular row very close to outer margin of corbicle (fig. 134).

Terminalia: Gonostylus as illustrated (fig. 191).

Length of body: 8.57(8.55–8.60).

Female: Three specimens. Very similar to male, measurements somewhat larger.

Head: Width-length ratio, 2.05(2.02–2.06):1.79(1.72–1.85); interocular width, 1.37(1.36–1.40); width of eye, 0.32(0.32–0.33). Antennal segments: I, 0.75(0.73–0.76); II, 0.69(0.66–0.73); III, 0.51(0.50–0.53); IV, 0.71(0.70–0.73). Labial segments: I, 0.66(0.60–0.70); II, 0.74(0.70–0.76); III, 0.46(0.43–0.50); IV, 0.41(0.40–0.43).

Pronotum: Length-width ratio, 3.43(3.22–3.75):5.47(5.25–5.83).

Scutellum: Length-width ratio, 4.07(4.00–4.14):3.23(3.07–3.48).

Length of body: 9.33(9.00–9.60).

Type data.—The type series of "many specimens," including nymphs as well as adults, was originally recorded by Champion (1900, p. 256) as coming from "Guatemala, Capetillo." Some of these specimens are probably still in the British Museum (Natural History).

Champion (1900, p. 256) reported that the types had "been found underground, at the roots of sugar cane and other plants."

Specimens studied.—2 males, 9 females, 1 nymph.

Mexico: *Chiapas:* Huixtla, 1939, B. D. Pelaez, 5 females (Pel, RCF).

Guatemala: West coast, Nov. 20, 1928, V. C. Dunlap, 1 male, 4 females, 1 nymph (USNM). Guatemala, J. G. Salas, on sugar cane, 1 male (USNM).

Scaptocoris castanea Perty

Plate figures 135, 192

Scaptocoris castanea Perty, 1833, p. 166, pl. 33, fig. 5.

Scaptocoris terginus (not of Schiödte) Stål, 1876, p. 17.—Signoret, 1881b, p. 42, pl. 1, fig. 3.—Berg, 1884, p. 11 (part).—Lethierry and Severin, 1893, p. 61 (part).—Torre Bueno, 1914, p. 162 (part).

Diagnosis.—The small size and lack of distinct punctures on the posterior lobe of the pronotum will separate this species from the others in the genus.

Description.—Male (from two specimens):

Head: Wider than long, 1.5(1.40–1.63):1.36(1.33–1.40); interocular width, 1.05(0.96–1.14); ocellus large, separated from eye by less than an ocellar width; clypeus narrow, parallel-sided, reaching or slightly

surpassing apices of juga. Antennal segments: I, 0.48(0.43–0.53); II, 0.51(0.50–0.53); III, 0.43(0.43–??); IV, 0.60(0.60–??). Labial segments: I, 0.50(0.50–0.50); II, 0.56(0.53–0.60); III, 0.39(0.36–0.43; IV, 0.36(0.36–0.36).

Pronotum: Length-width ratio, 2.65(2.46–2.85):4.39(4.11–4.57); transverse rugae impunctate or very feebly punctured.

Hemelytron: Corium polished, with scattered, fine, weak punctures; membrane surpassing apex of abdomen by about one-half its length.

Legs: Corbicle of hind tibia with a double, irregular row of transverse tubercles on the outer half but well separated from edge of corbicle.

Terminalia: Gonostylus as illustrated (fig. 192).

Color: Yellowish brown, apices of anterior tarsi and marginal teeth of corbicle darker brown to blackish.

Length of body: 7.12(6.75–7.50).

Female: Very similar to male, but measurements more variable, averaging larger.

Head: Width-length ratio, 1.64(1.44–1.73):1.36(1.16–1.46); interocular width, 1.09(0.93–1.20); width of eye, 0.27(0.25–0.29). Antennal segments: I, 0.46(0.43–0.50): II, 0.54(0.50–0.58); III, 0.43(0.43–0.43); IV, 0.58(0.56–0.63). Labial segments: I, 0.56(0.53–0.60); II, 0.59(0.50–0.66); III, 0.39(0.36–0.43); IV, 0.58(0.56–0.63).

Pronotum: Length-width ratio, 2.75(2.31–3.00):4.60(3.78–4.78).

Scutellum: Length-width ratio, 3.43(3.22–3.79):2.85(2.43–3.15).

Length of body: 7.37(6.45–7.80).

Type data.—Perty originally reported the type (now in the Zoologisches Museum, Munich) as "Habitat in Provincia Piauhiensis," Brazil.

Discussion.—Costa Lima (1940) reported that this species damaged tomatoes and pimentos in Argentina and was of economic importance in Brazil.

Personal examination of Perty's type has left no doubt in the author's mind that this is the correct application of the name *castaneus*. The literature records for specimens from Cuba, Trinidad, and Venezuela are certainly questionable, and in the present paper such specimens have been transferred to *divergens*, new species.

Specimens studied.—10 males, 13 females.

Argentina: Patquia, K. J. Hayward, 1 male, 1 female (BrM). Mendoza, 1 female (MCZ). Perico to Embarcación, May 19, 1920, G. I. Harrington, 1 female (USNM). Tucumán, 450 meters, Rosenberg, 1 male, 2 females (USNM). Cafayate, Mar. 12, 1951, F. Monros, 1 male, 1 female (UnivTuc). Santa Rosa de Leales, January 1948, B. García, 4 males, 2 females (UnivTuc). Fronterita, Mar. 12, 1948, Ares, 3 males, 3 females (UnivTuc). Mar del Plata, 1 female (UnivTuc).

Brazil: Provincia Piauhiensis, 1 female (Zoologisches Museum, Munich).

Subfamily Cydninae

Cydnides Billberg, 1820, p. 70.

Diagnosis.—Technically, members of this subfamily may be recognized by the arrangement of the trichobothria (see discussion of subfamilies on page 352) or the venation of the metathoracic wing shape of radial cell plus absence of hamus (see page 353). More readily available means of determination, however, have been pointed out in the key to subfamilies. The following features must be used together: lack of claval commissure, front tarsus arising at or near apex of tibia, and the presence of a lateral, submarginal row of setigerous punctures on the pronotum.

Description.—Head: Margin entire, not crenulate; antennae 4- or 5-segmented.

Scutellum: Long, surpassing apices of clavi, latter not forming commissure posterior to scutellar apex.

Thoracic pleurae: Posterior margins all well developed, propleuron with strong convexity posterior to depression; mesopleuron with posterior margin touching or overlapping metapleuron for most or all of its width; metapleuron with posterior margin reaching to base of abdomen for its full width and completely covering internal part of hind coxa.

Legs: Weakly or strongly modified. Anterior tibia of all strongly compressed, a row of stout spines dorsally; middle legs feebly or not modified; posterior legs variously terete or compressed, straight, curved, or sinuate, rows of spines regularly spaced or crowded on dorsal and ventral margins; tarsi present on all legs, segment II shortest, subequal in diameter to I and III.

Sternites: Sutures nearly straight, not strongly sinuate laterally; trichobothria arranged differently on each segment—on VII arranged in transverse row behind spiracle, on VI to III successively the ventral trichobothrium shifts farther forward until on III it lies mesad or mesoanteriorly to the spiracle (fig. 172).

Terminalia: Male genital capsule opening dorsally; female plates well developed, mostly exposed (fig. 186).

Type of subfamily.—Genus *Cydnus* Fabricius (1803, p. 184).

Distribution.—Available information showed that the full geographic range of the family—worldwide, in all zoogeographic regions—is occupied by members of this subfamily.

Discussion.—This subfamily not only contains more genera and species than all the other subfamilies combined but appears also to show greater contrasting extremes of morphological modifications. On the basis of the wing venation, trichobothrial arrangement, and the head structure, the Cydninae appear to be more closely related

to the Sehirinae and the Garsauriinae than to the Scaptocorinae and Amnestinae.

A complete life cycle study of one or more species of the Cydninae is a great desideratum. Although only scattered, fragmentary biological notes are available, the probable life history as outlined in the discussion of the family is true, even if very incomplete.

The separation and definition of the included genera have been difficult, and even yet may be considered far from complete. The search for characters that would permit concise, clear-cut definitions of genera has been only partially successful. The relative value given to any set of characters may vary with workers, so that the included, conservative number of genera may be greatly increased by those who see fit to assign higher taxonomic worth to some of the features here relegated to a position below a genus. In a family as poorly known and as uniform as this one appears to be, any marked structural feature presents a great temptation to the worker to establish a genus—regardless of whether the modification has any fundamental value. This type of splitting results in numerous monotypic genera that may be based on secondary sexual characters, adaptive modifications, or even "ornamental" features of a single species. I consider that several monotypic genera of the Western Hemisphere fall in this category and must be suppressed; they are *Colobophrys* Horváth, *Pachymeroides* Signoret, *Psectrocephalus* Van Duzee, and *Syllobus* Signoret. These are reduced to subgenera or full synonyms in the text, where full explanations are also given. All of these were based on a single superficial but prominent character. They all remained monotypic.

One of the most important and useful characters, used first by Uhler (1877) and later to a lesser extent by Signoret (1881 to 1884), is the modification of the osteole and its peritreme. These features will permit the arrangement of the genera of the world into two groups which, for convenience and to avoid any suggestion of a nomenclatorial position, will be referred to as Groups A and B.

Group A can be defined as including those genera that show a definitely differentiated terminal structure on the anterior part of the osteolar peritreme (figs. 89–100), the differentiation being due either to definite widening of the terminal part or to a marked difference in texture (i.e., being very shining, polished), or a combination of both. The position of the actual osteolar opening, whether visible ventrally at the base of the terminal lobe or opening posteriorly (not visible ventrally) on the peritreme, also shows some significance.

Group B would include those genera that do not show any such terminal modification on the anterior part of the peritreme (figs. 102–112). In addition, all members of this group have the osteole opening posteriorly on the peritreme so that it is not visible ventrally.

The separation of the genera in each of these two groups must be based on an entirely different set of characters. In Group A the modifications of the terminal lobe of the peritreme furnish abundant generic separations. One section of the group exhibits a short, expanded lobe of various shapes and textures (figs. 90, 95–100); a second section has the terminal modification markedly transversely elongate and with or without a recurved apical part (figs. 89, 91–94). In each section there appear some additional modifications that aid in further separation of the genera, so that only very few of the features shown by other body parts are required for delimiting the genera within Group A.

Group B is characterized by the lack of terminal modifications of the peritreme (figs. 102–112); therefore, characters derived from other parts of the body must be used for separating the included genera. Several usable and apparently significant features may be used to separate most of these genera, but at the end of the series there accumulates a very heterogeneous mass of species for which no satisfactory separation was found. An admittedly very weak feature is presented to separate this unwieldy mass into two groups for which generic names are already available. These two genera, *Dallasiellus* Berg and *Tominotus* Mulsant and Rey, each include species that appear to be closer to certain of those in the other genus than to some of the more remote members of the same genus, and this condition led the author to hunt for additional breaks, but a more satisfactory one was not found.

The author has been deliberately conservative in accepting genera in both groups and believes that numerous genera of but one or a few species emphasize the difference between species rather than their relationships. Consequently, in this paper, genera are defined by groups of characters possessed in common rather than by single differences. The results of such an approach may be very unsatisfactory to those who hold the opposite view, so an effort was made to compromise the two viewpoints by retaining some of the lesser differences to establish subgenera. Thus the relationships as well as the more conspicuous structural modifications may be recognized.

The following tabulation of the Cydninae occurring in the Western Hemisphere indicates the author's current conclusions.

1*a*. Anterior part of peritreme terminated by a differentiated lobe, loop, or band (figs. 89–101); osteolar opening usually visible ventrally at base of terminal process.

2*a*. Terminal process of peritreme elongate, transverse length more than three times width (figs. 91–94).

3*a*. Terminal process fused with cuticula, forming a flat, polished band extending almost or quite to lateral margin of evaporatorium and separated therefrom by a distinct, impressed line (figs. 92–94). **Rhytidoporus**

3*b*. Terminal process a narrow, shallow trough with extreme apex convex and recurved (fig. 91) . . . . **Macroporus**

2*b*. Terminal process short, transverse length not more than twice width.

4*a*. Metapleural evaporatorium limited, simply outlining peritreme (fig. 90). **Microporus**

4*b*. Metapleural evaporatorium extensive, occupying most of segment (figs. 95–97).

5*a*. Terminal process large, elongate-oval, with one to three longitudinal rugae discally (fig. 89) . . . . **Cydnus**

5*b*. Terminal process not elongate-oval, without rugae (figs. 95–97, 101). **Ectinopus; Melanaethus; Onalips**

1*b*. Anterior part of osteolar peritreme not differentiated terminally (figs. 102–112), posterior part sometimes with spinelike or tonguelike process; osteole opening posteriorly on peritreme, not visible ventrally.

6*a*. Pronotum with a sharply defined, deeply impressed transverse line paralleling anterior margin from side to side (figs. 14, 73) . . **Pangaeus**

6*b*. Pronotum without such a line.

7*a*. Posterior tibia strongly compressed, spines confined to dorsal and ventral margins, ventral spines longer, thinner and more tapering than those of dorsal margin (figs. 141, 142).

8*a*. Labial II with a semicircular foliaceous lobe (fig. 36) . . **Prolobodes**

8*b*. Labial II without such a lobe (fig. 34) . . . . **Cyrtomenus**

7*b*. Posterior tibia not compressed, spines rather uniformly developed on all margins (figs. 140, 148–150) . . . . . **Dallasiellus; Tominotus**

In the above arrangement, two points are worthy of mention. First, the two genera listed under 7*b* represent those which were stated above to be very difficult to separate fully and satisfactorily. As previously mentioned, this is a "residual area" of negative characters that includes a number of species groups. But whether these groups are worthy of generic, subgeneric, or even lower standing is not yet evident. For convenience they are held thus. Supporting evidence will be found in the generic discussions of them.

The second noteworthy point is the absence of certain familiar generic names like *Aethus*, *Geocnethus*, and *Geotomus*. These three genera have Old World genotypes and none of our forms is congeneric with them. In general, our species formerly assigned to *Aethus* belong to *Tominotus*; those listed as *Geocnethus* go to *Dallasiellus*; and the name *Melanaethus* replaces *Geotomus* in the Western Hemisphere. These name changes are discussed under the appropriate generic discussions. With these and certain other generic redefinitions resulting from a companion study on the Old World forms, each genus now assumes a zoogeographic significance that it formerly lacked.

Key to genera of Cydninae known in the Western Hemisphere

1. Anterior part of osteolar peritreme modified apically into a distinctly differentiated loop, lobe, or band which is wider than basal part of peritreme and more or less polished (figs. 89–101) 2

Anterior part of osteolar peritreme without enlarged, differentiated apical structure, sometimes with a small, subapical, posterior hooklike or flaplike projection (figs. 102–112) 8

2. Osteolar peritreme with apical process elongate, transverse length three or more times width (figs. 91–94) 3

Osteolar peritreme with apical process short, transverse length not more than two times width 4

3. Osteolar peritreme an elevated, troughlike structure extending almost to lateral margin of segment where it forms a recurved, polished lobe (fig. 91) . . . . **Macroporus** Uhler (p. 394)

Osteolar peritreme a transverse polished band, neither elevated, troughlike nor recurved apically (figs. 92–94) . . . . . **Rhytidoporus** Uhler (p. 382)

4. Membrane occupying half of hemelytral length (figs. 4, 15) 5

Membrane not more than two-fifths of hemelytral length 6

5. Terminal osteolar process large, elongate-oval, with one to three longitudinal rugae discally (fig. 89) . . . . **Cydnus** Fabricius (p. 406)

Terminal process of peritreme small, not elongate (figs. 100, 101). **Ectinopus** Dallas (p. 410)

6. Metapleural evaporatorium very limited, just outlining peritreme, not approaching metapleural lamella posteriorly (fig. 90). **Microporus** Uhler (p. 397)

Metapleural evaporatorium more extensive, occupying more than half of sclerite and nearly or quite reaching base of metapleural lamella posteriorly (figs. 91–103) 7

7. Terminal process of peritreme scoop-shaped or auricular, with osteole conspicuously visible ventrally at its base (fig. 95). **Onalips** Signoret (p. 415)

Terminal process of peritreme flat, simply expanded posteriorly as a more or less polished lobe, osteole opening posteriorly, not conspicuous ventrally (figs. 96, 97) . . . . **Melanaethus** Uhler (p. 421)

8. Pronotum anteriorly with deep, sharply impressed line paralleling anterior margin from side to side (this line usually impunctate). **Pangaeus** Stål (p. 455)

Pronotum anteriorly without this impressed line, although often with a row of punctures in the same area (rarely with partial, vague line laterally) . 9

9 Posterior tibia conspicuously compressed, anterior and posterior faces glabrous, not spined; spines of posteroventral margin conspicuously longer, thinner and more tapering than those of dorsal margin (figs. 141, 142) 10

Posterior tibia not or only weakly compressed; dorsal and ventral spines about equally developed 11

10. Labial II with large, semicircular, foliaceous lobe, this often hidden between anterior coxae (fig. 36) . . . . **Prolobodes** Amyot and Serville (p. 508)

Labial II somewhat compressed, but without large, foliaceous lobe (fig. 34). **Cyrtomenus** Amyot and Serville (p. 514)

11. Head with a complete row (extending from eye to apex of jugum) of coarse, more or less contiguous punctures giving rise to numerous long hairs and usually also to a row of pegs (figs. 54, 55). **Tominotus** Mulsant and Rey (p. 539)

Head without a complete row (absent or extending not more than three-fourths of way to apical angle of jugum) of coarse setigerous puncture; pegs never present (figs. 41–45) . . . . . . **Dallasiellus** Berg (p. 570)

Genus *Rhytidoporus* Uhler, new status

Aethus of authors, nec Dallas, 1851, p. 110.
Rhytidoporus Uhler, 1877, p. 380.
Cryptoporus Uhler, 1877, p. 381, nec Motschulsky (1858) in Coleoptera. New synonymy.
Bergthora Kirkaldy, 1904, p. 280. New synonymy.
Findalia Jensen-Haarup, 1926, p. 51. New synonymy.

Diagnosis.—The narrow, shining bandlike extension of the peritreme which interrupts the metapleural evaporatorium anteriorly (figs. 92–94) will separate the members of this genus from all others in the Western Hemisphere.

Description.—Small; length of body, 3.5–6.0; oval, widest approximately at or slightly posterior to middle; dorsum much less convex than venter.

Head: Length nearly two-thirds width, flattened or slightly convex above; juga as long as clypeus; juga with fine marginal carina dorsally, either with complete (including apex of clypeus) row of submarginal punctures with their setae becoming finer towards eye, or with one preocular seta and one half way to apex; eyes large, but slightly projecting; ocelli absent or well developed, when present located on or slightly behind a line connecting hind margins of eyes and separated from eyes by not more than twice transverse ocellar width; antennae 5-segmented, I shortest, II slightly shorter or equal to III, latter subequal to or shorter than IV which may be almost as long as V; bucculae moderately high, reaching nearly to base of head; labium reaching between middle coxae (*lucida*?), IV shortest, II longest, III shorter than I, II slightly compressed but without foliaceous lobe.

Pronotum: Length about half width, distinctly narrowed from base; side margins carinate, straight or convex on basal two-thirds or more, with 4 to 8 or about 20 setigerous punctures submarginally; anterior margin shallowly to deeply emarginate; transverse impression weak to absent, usually marked by a row of distinct punctures; posterior margin broadly but slightly convex, all angles rounded.

Scutellum: Shorter than, equal to, or longer than width, triangular, apex narrowed and less than or slightly wider than half of membranal suture; disc with distinct punctures.

Hemelytron: Areas weakly or well defined, membranal suture straight or slightly projecting laterally; costa with 1 or 2, or about 15 to 20 setigerous punctures; membrane not over two-fifths of hemelytral length, usually reaching or slightly surpassing apex of abdomen, hyaline and faintly clouded with brown.

Propleuron: Moderately convex anterior to depression, latter with or without coarse punctures; prosternal carinae low, rather sharp; anterior margin slightly lobulate either side of middle.

Mesopleuron (figs. 92–94): Flat, evaporative area occupying all but extreme lateral area and posterolateral angle; posterior margin entire; mesosternum prominent to subcarinate along median line, with numerous long hairs.

Metapleuron (figs. 92–94): Flat, osteolar canal extended laterally to limit of evaporative area as a flat, posteriorly sharply delimited band that is in large part polished; osteole usually opening at base of a lobulate auricle, latter absent (fig. 93*a*) in subgenus *Bergthora*.

Legs: Moderately long, slender; anterior tibia (fig. 124) moderately widened, with seven or eight stout spines on outer margin, not prolonged beyond tarsal insertion; middle and posterior tibiae slender; latter terete, slightly more than one-third body length; tarsal II shortest, I subequal to or shorter than III.

Sternites: Strongly convex, shining, with or without setigerous punctures; posterior margin of each sternite with numerous fine, sharp crenulations on lateral third or more.

Nymph: A third (?) instar nymph collected with adults on "strawberry" showed the head with the fine marginal carina dorsally and the submarginal series of stout spines and longer cilia.

Type of genus.—*Rhytidoporus indentatus* Uhler (1877, p. 380), monobasic; of *Cryptoporus* Uhler (1877) nec Motschulsky (1858) in Coleoptera, *Cryptoporus compactus* Uhler (1877, p. 382), monobasic; *Bergthora* Kirkaldy (1904) was proposed as a new name for *Cryptoporus* Uhler and so takes *Cryptoporus compactus* Uhler as genotype by objective synonymy; of *Findalia* Jensen-Haarup, *Findalia lucida* Jensen-Haarup (1926, p. 52), by original designation and monobasic.

Distribution.—The specimens studied indicated the range of this genus to be from Florida, New Mexico, and Texas in the southern United States and south into Mexico, Brazil, and the West Indies (Cuba, Haiti, Dominican Republic, Puerto Rico, and St. Croix).

Discussion.—The devaluation of the above three "genera" to subgeneric status is based chiefly on the fact that all three possess the important and unique apical modification of the peritreme. Admittedly, the three subgenera are not equally closely related. The subgenera *Rhytidoporus* and *Bergthora*, as indicated by the following key, are more closely related to each other than to the South American *Findalia*. The fact that no male specimen of *Findalia* was available for study was unfortunate, because it prevented determination of the position of that subgenus in relation to the other two as regards the shape of the male gonostylus. In respect to this structure, *Rhytidoporus* shows an interesting divergence from *Bergthora* in bearing at the dorsal angle an unusual mesal, spine-like projection (figs. 193, 194) which is absent in the single species of the latter subgenus (fig. 195).

The relationships of the subgenera of *Rhytidoporus* reflects the same situation that Osborn (1933) pointed out for many of the Auchenorrhynchus Homoptera. The forms that occur on the eastern end of the Antilles chain are more closely related to those of the western part of the chain and in Central America than to those occurring on the South American continent. The West Indian *Rhytidoporus* (sen. str.) are certainly more closely related to *Bergthora* than to the South American *Findalia*.

Key to the subgenera of *Rhytidoporus*

1. Submargin of head with two submarginal setigerous punctures, one in front of eye and one half way to apex; metapleural evaporatorium reaching lateral margin of segment . . . . **Findalia** Jensen-Haarup (p. 392)
   Submargin of head (including apex of clypeus) with row of coarse, close-set setigerous punctures; metapleural evaporatorium not reaching lateral margin of segment 2
2. Costa with one to three setigerous punctures; osteolar auricle distinctly developed (fig. 92) . . . . **Rhytidoporus** Uhler (p. 384)
   Costa with about 15 setigerous punctures; osteolar auricle absent (fig. 93) . . . . **Bergthora** Kirkaldy (p. 390)

Subgenus *Rhytidoporus* (*Rhytidoporus*) Uhler

Rhytidoporus Uhler, 1877, p. 380.

Diagnosis.—The submarginal row of setigerous punctures on the jugum coupled with the few setigerous punctures on the costa will define this subgenus.

Type of subgenus.—*Rhytidoporus indentatus* Uhler (1877, p. 380), monobasic.

Distribution.—The members of this subgenus apparently are native to the West Indies, although one species has invaded the southern part of peninsular Florida on the mainland. This is in contrast to the lone species of each of the other two subgenera which have continental ranges.

Discussion.—The included species appear rather closely allied to each other, *obsoletus*, new species, being the most distinct.

Key to species of the subgenus *Rhytidoporus* (*Rhytidoporus*)

1. Ocelli present, prominent; membrane longer than basal width 2
   Ocelli absent; membrane short, length not greater than basal width.
   obsoletus, new species (p. 389)
2. Pronotum laterally with submarginal row of ten setigerous punctures; terminal process of peritreme limited apically by narrow strip of evaporatorium (fig. 93b) . . . . **diminutus** (Ruckes) (p. 386)
   Pronotum laterally with submarginal row of five or six setigerous punctures; terminal process of peritreme extended all the way to edge of evaporatorium (fig. 92) 3

3\. Head broadly rounded, semicircular or slightly truncated apically (fig. 52); pronotal disc immediately behind anterior emargination with a single row of a few (usually two to seven) coarse punctures between setigerous punctures posterior to inner angle of eyes . . . . . . **indentatus** Uhler (p. 387)
Head less broadly rounded (fig. 53); pronotum immediately behind anterior emargination with many (about 15) coarse punctures between setigerous punctures . . . . **barberi,** new species (p. 395)

Rhytidoporus (*Rhytidoporus*) *barberi*, new species

PLATE FIGURES 53, 194

DIAGNOSIS.—This new species, here described from a single male, may be characterized by the presence of ocelli and the numerous (about 15) punctures immediately behind the anterior emargination of the pronotum. The short, mesally projecting dorsal spine of the gonostylus also separates this from the males of other known species.

DESCRIPTION.—MALE: Only specimen known. Oval.

Head: Wider than long, 1.13 : 0.70; interocular width, 0.66; margins of paraclypei less broadly rounded (fig. 53). Antennal segments: I, 0.16; II, 0.23; III, 0.26; IV, 0.36; V, 0.43. Surface shining, with few weak, radiating rugae, three or four moderate punctures anterior to and between ocelli. Labial segments: I, 0.46; II, 0.56; III, 0.46; IV, 0.40.

Pronotum: Nearly twice as wide as long, 2.34 : 1.23; anterior lobe with moderate, subapical impression bearing about 15 distinct punctures, and with several punctures laterally; transverse impression obsolete, marked by an irregular row of close-set, moderate punctures; posterior lobe with a few scattered punctures discally; side margins with six setigerous punctures.

Scutellum: Length and width equal, 1.43; irregularly and distinctly punctured over surface except at base and apex.

Hemelytron: Shining, discal area with numerous fine punctures and several coarser ones scattered over full length; clavocorial suture distinctly impressed, bordered by two complete rows of distinct, coarse punctures; limiting impressions of radial veins punctured; clavus with a more or less regular row of distinct punctures on basal half; costa with one setigerous puncture, membrane hyaline, faintly yellowed, with a median brownish cloud; longer than basal width, surpassing apex of abdomen by about one-third its length.

Terminalia: Gonostylus as illustrated (fig. 194), mesal dorsal tooth short, edge posterior to it deeply concave.

Length of body: 4.10.

TYPE DATA.—Holotype male (USNM 64425), "St. Croix, V. I., H. A. Beatty, No. 741/1937."

DISCUSSION.—This specimen bore a label of H. G. Barber as "*Aethus* sp. ?, near *indentatus*." Because of this finely studied con-

clusion the species is being named in honor of that outstanding American hemipterist.

Rhytidoporus (_Rhytidoporus_) _diminutus_ (Ruckes), new combination

Plate figure 93b

Aethus diminutus Ruckes, 1952, p. 2.

Diagnosis.—The presence of a narrow band of the evaporatorium beyond the apex of the peritreme will separate this species from all others in the genus.

Description.—In the absence of specimens for study, the original description will be quoted and followed by a few comments based on mesopleural and metapleural structures taken from two sketches of those areas on the types as kindly furnished by Dr. Ruckes.

Castaneus brown to dark fuscous, slightly obovate in outline. Head as wide between the eyes as long through its midline; apex evenly rounded as in allied species; spines along the anterior margin short, blunt, and all of the same size; two spines on apex of tylus and five on anterolateral margin of each jugum; only three long setae on each jugal margin just in front of eyes; two setae on each side of disc of head, one in front of each eye and one just behind the anterior margin; a pair of setae, one long and one short, on the under side of the apical margin just lateral of the base of the buccula. Pronotal disc slightly convex, without any indentations, a vague double row of obsolescent, wide-spaced punctures across the posterior half; a pair of large setigerous pits near apical margin diagonally behind the ocelli; a pair of less pronounced setigerous punctures inside each lateral margin, one near anterior angle and one larger, about midway along the length; marginal setae of pronotum at least ten in number on each side. Scutellum with a few small, scattered punctures on the disc; marginal punctures indistinct and tending to become confluent posteriorly; apex of scutellum almost angulate rather than rounded Hemelytra with some scattered punctures on disc; a row of distinct punctures following the cubital vein, with a second row laterally, converging towards the former posteriorly; a row of subcostal and radial punctures present but not distinct; costal margin with three long setae on the basal third; membrane clear hyaline, with a small fuscous spot near the middle of its base. Abdominal venter impunctate, apical edges of segments obscurely roughened; only two setae laterally on each segment adjacent to spiracle. Mesosternal evaporating area very large, reaching the lateral margins of the supporting sclerites. Rostrum nearly reaching posterior margins of mesocoxae, second joint almost as long as third and fourth combined. Antennal segments I, II, and III subequal, each slightly shorter than segments IV and V, which in themselves are subequal. Antennae, rostrum, and tarsi testaceous, each becoming paler apically. Hypopygium of the male broadly scoop-shaped, its apical margin entire.

Holotype: Male, 3.75 mm. long, 2.25 wide across humeri, South Bimini Island, Bahama Islands, British West Indies, May, 1951 (collected by Cazier and Gertsch).

Allotype: Female, 4 mm. long, 2.5 mm. wide across humeri, same data as for the holotype.

Dr. Ruckes' sketches of the pleurae of both types show both the mesopleural and metapleural evaporatoria as being characteristic for

the genus; the most outstanding feature being that the terminal process stops just short of the lateral margin of the metapleural evaporatorium (fig. 93b, based on Ruckes' sketch of male holotype).

Type data.—The type series consisted of only the holotype male and allotype female (both in AmM). The type locality is listed in the original description quoted above.

Specimens studied.—None.

Discussion.—The sketches of the evaporatoria do not bear out the statement, in the original description, "Mesosternal evaporating area very large, reaching the lateral margin of the supporting sclerites." The sketches show both the mesopleural and metapleural evaporatoria to be similar to those of *indentatus* in approaching but not actually attaining lateral margin of segment.

Rhytidoporus (Rhytidoporus) indentatus Uhler

Plate figures 5, 32, 52, 92, 124, 146, 193

Rhytidoporus indentatus Uhler, 1877, p. 380.—Distant, 1880, p. 4.
Aethus (Rhytidoporus) indentatus Signoret, 1882, p. 38, pl. 2, fig. 80.—Torre Bueno, 1939, p. 179.
Aethus indentatus Uhler, 1886, p. 3.—Van Duzee, 1917, p. 20.—Barber and Bruner, 1932, p. 235.—Barber, 1939, p. 271.
Cydnus indentatus Lethierry and Severin, 1893, p. 66.—Banks, 1910, p. 99.

Diagnosis.—The presence of ocelli and the absence of, or the presence of but a few, coarse punctures immediately posterior to the anterior pronotal emargination sets this species apart from others in the group (fig. 5).

Description.—male: Oval.

Head: Wider than long, 1.12(1.04–1.30):0.78(0.73–0.86); interocular width 0.66(0.61–0.76); surface smooth, with wide, very feeble radiating lines, impunctate or with a few fine punctures anterior to ocelli; ocellar width 0.06(0.06–0.08); subequal to half of space separating it from an eye, 0.11(0.10–0.13). Antennal segments: I, 0.24(0.23–0.30); II, 0.22(0.20–0.26); III, 0.29(0.24–0.36); IV, 0.37(0.33–0.46); V, 0.51(0.46–0.56). Labial segments: I, 0.40(0.36–0.46); II, 0.59(0.53–0.70); III, 0.45(0.40–0.53); IV, 0.33(0.30–0.40).

Pronotum: Wider than long, 2.28(2.08–2.73):1.26(1.07–1.43); transverse impression near midlength, weakly indicated and usually obsolete at middle; anterior lobe transversely convex, usually with a noticeable triangular impression anteriorly, surface polished, impunctate except for a few punctures behind anterior emargination and usually a variable number near sides; site of transverse impression with an irregular row of fine punctures that are sparse medially and denser laterally; posterior lobe impunctate or with a few widely

scattered very fine punctures; lateral submargins with five or six setigerous punctures.

Scutellum: As long as or slightly longer than basal width, 1.46 (1.36–1.69):1.41(1.30–1.62); apex narrowed; impunctate basally and at apex, discally with several scattered punctures.

Hemelytron: Areas well defined, surface polished, discally with few or no coarse punctures; two inner rows of punctures bordering clavus distinct, second row nearly complete; clavus with a partial row of punctures on basal half or less.

Terminalia: Genital capsule with rim faintly recurved, entire or vaguely emarginate at middle apex; gonostylus as illustrated (fig. 193), the dorsomedial projection very long.

Length of body: 4.29(3.85–5.00).

Female: Very similar to male, but with impression of anterior pronotal lobe weak or absent and measurements slightly larger.

Head: Width-length ratio, 1.19(1.06–1.33):0.77(0.73–0.86); interocular width 0.71(0.63–0.80); ocellar width, 0.06(0.06–0.08); space separating ocellus from eye 0.12(0.10–0.16). Antennal segments: I, 0.24(0.20–0.26); II, 0.24(0.18–0.30); III, 0.30(0.26–0.36); IV, 0.42(0.36–0.53); V, 0.54(0.50–0.60). Labial segments: I, 0.43(0.36–0.51); II, 0.61(0.53–0.73); III, 0.48(0.41–0.60); IV, 0.33(0.33–0.36).

Pronotum: Width-length ratio, 2.43(2.15–2.79):1.27(1.10–1.43).

Scutellum: Length-width ratio, 1.61(1.36–1.89):1.50(1.30–1.75).

Length of body: 4.42(3.85–5.28).

Type data.—In the U.S. National Museum, Uhler (1877, p. 381) wrote of the material on which his descriptions were based as follows: "Inhabits Cuba, and has been collected in various parts of the island by Prof. Poey and Mr. Charles Wright. Southern Florida, Dr. E. Palmer."

Specimens studied.—24 males, 36 females.

United States: *Florida:* Dade Co., Deerfield, Fort Pierce, Homestead, Lakeland, Lake Placid, Miami, Royal Palm; for all months of the year.

Cuba: Buenos Aires (Trinidad Mts.), Cabanas, Guanajay, Mina Carlota (Trinidad Mts.), Santiago de las Vegas, Soledad, Upper Yara Valley; August–April.

Haiti: Desbarriere, Ennery, Etang Lachaux, Grand Rivière, Jacmel, Kenscoff, mountains near Port-au-Prince; January, September, October.

Dominican Republic: Constanza, Mt. Diego de Ocampo, Sanchez; July, August.

Puerto Rico: Aquirre, El Yongue; January, May, October.

St. Croix Island: Southern end; July.

Discussion.—The present species is quite variable in length and width of body, in median impression and lateral punctation of anterior lobe of pronotum, and in proportionate length of antennal segments

II and III (II varying from two-thirds as long to subequal in length to III). Without intermediates one might be tempted to separate some of these, but as lots bearing the same data often showed these as well as intermediates in varying combinations, the temptation was greatly lessened. The most persistent doubt as to the validity of this lumping was raised by a small series of large specimens from the Dominican Republic and Puerto Rico which shows a more marked impression of the anterior pronotal lobe in both sexes. However, the males of that series show the long mediodorsal projection on the gonostylus that is present in the others assigned here. Some of this material was reported by Barber and Bruner (1932) as *indentatus*, but their comment that "The males have the anterior disc on the pronotum quite plainly depressed" was not true of all males studied, as some of the smaller ones lacked the depression.

In spite of these tentative conclusions, goodly series of specimens from more localities might validate some sort of separation of some of these variations.

Wolcott (1936, p. 181) reported this species "at light," "on dung" and "eaten by *Ameiva exsul*," an iguana in Puerto Rico. Later (1948, p. 189) he wrote that it had been collected "From numerous humid localities of coast and mountains" on the same island, and repeated that it was found to be "an item of food of the iguana, *Ameiva exsul*."

Rhytidoporus (*Rhytidoporus*) *obsoletus*, new species

Diagnosis.—Any of several features will separate this species from the others within the genus. The absence of ocelli, the weakly defined corial areas, the very elongate and slender scutellar apex, or the short membrane may be relied upon. Unfortunately, this form is known only from females so the validity of these characters in relation to the males is purely conjectural.

Description.—Female (only sex known): Oval.

Head: Wider than long, 1.32(1.30–1.33):0.87(0.86–0.90), interocular width 0.91(0.90–0.93); surface smooth, with several very weak, radiating rugae; ocelli absent. Antennal segments: I, 0.28(0.26–0.30); II, 0.32(0.30–0.33); III, 0.36(0.36–0.40); IV, 0.51(0.50–0.53); V, 0.67(0.63–0.70). Labial segments: I, 0.62(0.60–0.66); II, 0.77 (0.76–0.80); III, 0.63(0.60–0.66); IV, 0.49(0.46–0.50).

Pronotum: More than twice as wide as long, 1.48(1.43–1.53): 0.71(0.70–0.73); transversely convex, smooth, with scattered moderate punctures submarginally to apex and sides of anterior lobe, along obsolete transverse impression and on disc of posterior lobe; side margins with five to seven setigerous punctures, none at basal angles.

Scutellum: Distinctly longer than broad, 1.17(1.13–1.23):0.97 (0.93–1.03); irregularly punctured over surface except at base and

apex; latter very narrowed and elongate, the narrowed tip about twice as long as broad.

Hemelytron: Corium shining, very faintly alutaceous, obsoletely wrinkled; corioclaval suture obsolete, the two rows of bordering punctures very weak; usually not or only very weakly punctate discally, along radial vein and in exocorial area; membrane brownish hyaline, not surpassing apex of abdomen, length subequal to basal width.

Length of body: 5.43(5.28–5.71).

Type data.—Holotype female (MCZ), "La Visite & vic., La Selle Range, 5–7000 ft., Sept. 16–23, Haiti, 1934, Darlington." Paratypes: 5 females (MCZ, USNM, RCF), same data as holotype.

Discussion.—This very distinct species is known only from six female specimens. However, sexual dimorphism is not strongly marked within this family so one may expect the males also to show the unusual features mentioned above.

Subgenus *Rhytidoporus* (*Bergthora*) Kirkaldy

Cryptoporus Uhler, 1877, p. 381, nec Motschulsky (1858) in Coleoptera.
Bergthora Kirkaldy, 1904, p. 280.

Diagnosis.—The single member of this subgenus separates most easily from the species in the other subgenera by the more numerous (15 to 20) setigerous punctures on the costa.

Type of subgenus.—*Cryptoporus compactus* Uhler (1877, p. 382), monobasic; of *Bergthora*, the same species by objective synonymy, the new generic name having been proposed to replace preoccupied *Cryptoporus* Uhler for which the type had already been fixed.

Distribution.—The members of this subgenus occur in a limited area in the southwestern United States (in Texas, New Mexico, and Arizona) and all of Mexico. As yet, it is not known to occur on any of the islands to the east or west of Mexico.

Rhytidoporus (*Bergthora*) *compactus* (Uhler), new combination

Plate figures 93a, 193

Cryptoporus compactus Uhler, 1877, p. 382.
Aethus (*Cryptoporus*) *compactus* Signoret, 1882, p. 41, pl. 2, fig. 63.—Torre Bueno, 1939, p. 179.
Aethus compactus Uhler, 1886, p. 3—Van Duzee, 1917, p. 20.
Cydnus compactus Lethierry and Severin, 1893, p. 65.—Banks, 1910, p. 99.

Diagnosis.—*R. compactus* is the only species in the subgenus.

Description.—Male: Oval, widest posterior to middle.

Head: Length two-thirds width, 0.82(1.78–0.93):1.21(1.16–1.33); interocular width, 0.82(0.78–0.93); anterior outline semicircular; clypeus as long as juga, slightly narrowed apically; surface convex,

shining, with numerous minute punctures and several obsolete, radiating rugae; ocelli small, separated from eye by space almost three times transverse ocellar width; jugum ventrally polished, impunctate; maxillary plate impunctate on apical half, obsoletely punctured on basal half. Antennal segments: I, 0.25(0.23–0.26); II, 0.21(0 16–0.23); III, 0.23(0.20–0.26); IV, 0.26(0.23–0.30); V, 0.28(0.26–0.30). Bucculae almost as high as labial II; labium reaching between middle coxae. Labial segments: I, 0.44(0.43–0.46); II, 0.53(0.50–0.56); III, 0.45(0.40–0.50); IV, 0.32(0.28–0.36).

Pronotum: Length slightly more than half width, 1.31(1.23–1.49):2.56(2.40–2.89); anterior margin deeply bimarginate; lateral margins entire, middle third straight or very weakly concave, submarginal row with about 30 to 35 setigerous punctures; transverse impression obsolete, usually marked by medially interrupted row of moderate punctures; anterior lobe with numerous small punctures subapically and laterally; posterior lobe with several irregular, small punctures and many minute punctures.

Scutellum: Length equal to, longer than, or shorter than width, 1.59(1.49–1.89):1.66(1.56–1.82); weakly alutaceous, disc with numerous well-separated large punctures and many minute punctures interspersed, occasionally with small, transverse rugae.

Hemelytron: Clavus and corium distinctly alutaceous; clavus with numerous distinct punctures, somewhat arranged in rows; mesocorium with numerous distinct punctures, with one and usually a second complete row of punctures paralleling claval suture; exocorium with numerous distinct punctures over entire length; costa with 15 to 20 setigerous punctures; membranal suture nearly straight, lateral angle not produced; membrane longer than basal width, reaching or surpassing apex of abdomen.

Propleuron: Feebly to distinctly alutaceous, impunctate.

Mesopleuron: Lateral area impunctate.

Metapleuron: Lateral area impunctate.

Sternites: Each with submedian transverse row of setigerous punctures; alutaceous, roughened on lateral third by short, longitudinal rugae.

Terminalia: Genital capsule punctate in lateral angle, apical margin entire or weakly sinuate medially; gonostylus (fig. 195) without mesal projection at dorsal angle.

Length of body: 4.22(4.00–4.57).

Female: Similar to male, measurements mostly averaging larger.

Head: Length-width ratio, 0.79(0.76–0.90):1.27(1.20–1.36); interocular width, 0.85(0.80–0.90). Antennal segments: I, 0.28(0.26–0.30); II, 0.20(0.16–0.23); III, 0.24(0.23–0.28); IV, 0.28(0.26–0.30); V, 0.30(0.30–

0.30). Labial segments: I, 0.45(0.43–0.50); II, 0.55(0.50–0.63); III, 0.43(0.40–0.46); IV, 0.31(0.30–0.33).

Pronotum: Length-width ratio, 1.38(1.30–1.49):2.74(2.60–2.93).

Scutellum: Length-width ratio, 1.75(1.62–1.89):1.78(1.62–1.89).

Length of body: 4.42(4.07–4.85).

Type data.—Uhler gave the locality of the type (USNM) as "Galveston Island, Texas."

Specimens studied.—38 males, 38 females.

United States: *Arizona:* Globe, Huachuca Mts., Patagonia, Pinery Canyon (Chiricahua Mts.); March, July. *California:* Coral Beach (Los Angeles Co.), Hynes, San Diego Co., Saticoy; April, May, October. *New Mexico:* Mesilla Park, Deming; August, December. *Texas:* Austin, Galveston, Padre Island, Tyler, Victoria; February to May.

Mexico: *Distrito Federal:* Peñón Viejo; April, June. *Mexico:* Tejupilco; June. *Sinaloa:* Mazatlán, Rosario; March. *Sonora:* Guaymas, Yavaros; July. *Yucatán:* Yucatán.

Discussion.—This appears to be a common species on the mainland within its range. It is not yet known to occur on any of the islands of the Caribbean Sea, thereby differing from the members of the subgenus *Rhytidoporus.*

Pearse's (1938, p. 239) note on this species, "in rubbish," in the Mexican State of Yucatán, was accidentally entered under the family name Fulgoridae. One of Pearse's specimens was seen during this study. In the collection of the Museum of Comparative Zoology, Harvard University, there is a specimen collected by W. M. Wheeler and mounted with two ants, suggesting the possibility that they were found in close association. The hemipteron is erroneously labeled as *Homoloporus congruus.*

Subgenus *Rhytidoporus* (*Findalia*) Jensen-Haarup, new status

Findalia Jensen-Haarup, 1926, p. 52.

Diagnosis.—The presence of but two submarginal setigerous punctures on each jugum readily separates this subgenus from the other two, each of which bears a row of submarginal setigerous punctures on jugum.

Description.—Head: Jugum with two submarginal setigerous punctures, one immediately in front of eye, one near middle; vertex with curved, obtuse carina between ocelli.

Pronotum: Transverse impression absent; surface nearly impunctate; side margins with but four submarginal setigerous punctures.

Hemelytron: Membrane small, about one-fourth hemelytral length.

Metapleuron: With distinct auricular process at osteole; evaporatorium reaching side margin of segment.

TYPE OF SUBGENUS.—*Findalia lucida* Jensen-Haarup (1926, p. 52), monobasic. The locality given with the original description was "Brazil," but the type specimen bears no locality label.

DISCUSSION.—Except for the development of the peritreme (a structure which I believe to be a prime phylogenetic indicator), the single species of the subgenus is well removed from the other species of the genus.

Rhytidoporus (Findalia) lucida (Jensen-Haarup), new combination

PLATE FIGURE 94

Findalia lucida Jensen-Haarup, 1926, p. 52.

DIAGNOSIS.—Since this is the only species known for this subgenus the subgeneric characters will place it within the genus.

DESCRIPTION.—Known only from the type female. FEMALE: Elongate-oval, nearly parallel-sided but slightly wider behind mid-length.

Head: Length about two-thirds width, 0.56:0.88; interocular width, 0.53; anterior outline semicircular, clypeus as long as juga, but slightly narrowed at apex; surface alutaceous, with scattered minute punctures; jugum with two submarginal setigerous punctures, one preocular and one near middle; ocelli moderately large, separated from eye by space subequal to transverse diameter of ocellus; jugum ventrally and maxillary plate polished, impunctate. Antennal segments: I, 0.20; II–V missing; bucculae nearly as high as labial II. Labial segments (III, IV, missing): I, 0.30:II, 0.53.

Pronotum: Length less than half width, 0.94:2.00; anterior margin deeply, doubly emarginate; lateral margin entire, more strongly curved on apical half, with submarginal row of four setigerous punctures; transverse impression absent, marked by one or two distinct punctures at extreme ends; surface, except for a few fine punctures near anterior margin and some scattered laterally, virtually impunctate.

Hemelytron: Clavus and corium finely alutaceous; clavus with one longitudinal row of punctures; mesocoriun with two complete rows of punctures paralleling claval suture, discally with a few distinct punctures that become more numerous apically; exocorium weakly convex, with numerous obsolete punctures for full length; costa very fine, with one small setegerous puncture subbasally; membranal suture slightly concave; membrane surpassing apex of abdomen, slightly longer than basal width.

Propleuron: Shining, obsoletely alutaceous, impunctate; prosternal carinae sharp, less than half as high as labial II.

Mesopleuron: Evaporatorium filling all but narrow anterior, posterior, and extreme lateral margins of segments.

Metapleuron (fig. 94): With well-developed auricle, near osteole; evaporatorium extending to lateral margin of segment; lateral area with few distinct punctures near evaporatorium.

Sternites: Polished, with numerous widely separated punctures on lateral third.

Length of body: 3.70.

Type data.—The type female (Copen) bears no locality label although Jensen-Haarup stated "Brazil" as the type locality (see discussion below).

Discussion.—In the absence of a locality label on the type, a question arises as to the source of the locality cited by Jensen-Haarup. One possible explanation is that he derived it from a manuscript "n. sp." label on the pin, the generic name of which was apparently based on the name of that country. Although some doubt may thus arise as to this truly being a species of the Western Hemisphere, the ligulate extension of the peritreme allies it to the present genus—and since this development is not known from any other locality in the world, the logical conclusion is that *lucida* is a species of the New World.

Genus *Macroporus* Uhler

Macroporus Uhler, 1876, p. 278.

Diagnosis.—The shape of the osteolar peritreme here extends more than three-fourths of the way to the lateral margin of the metapleuron where it ends in a conspicuous, recurved, polished lobe (fig. 91).

Description.—Small (3.2–4.4), broadly oval, greatest width behind middle; dorsum slightly, venter moderately, convex.

Head: Length almost three-fifths width, slightly convex above; outline semicircular, clypeus as long as juga; with fine, dorsal carina marginally; submargin, including clypeus, with complete row of coarse, close-set setigerous punctures giving rise to a complete row of pegs and a few hairs; eyes small, entire, moderately projecting; ocelli well developed, moderate in size, situated slightly posterior to line connecting hind margins of eyes, separated from eye by space less than transverse ocellar width; antennae 5-segmented, II shortest and most slender, III, IV, and V increasing slightly in length, all longer than I; bucculae low, reaching almost to base of head (fig. 30); labium reaching between middle coxae, II longest, compressed, without semicircular foliaceous lobe, III longer than I and IV which are subequal.

Pronotum: Length about half width; lateral margin entire, slightly convex, narrowing from base; anterior margin deeply and simply

emarginate; posterior margin subtruncate; anterior submarginal impressed line distinct from side to side; transverse impression postmedian, obsolete; dorsal surface abundantly punctate; lateral submargin with about 15 setigerous punctures.

Scutellum: Slightly wider than long, triangular, slightly narrowed at apical third where it is less than one-third of membranal suture; apex narrowly rounded; disc punctured.

Hemelytron: Corial areas poorly defined; membranal suture straight, strongly oblique; costa arcuate, explanate, with no setigerous punctures; membrane distinctly less than half of hemelytral length.

Propleuron: Alutaceous, impunctate; prosternal carinae very low; anterior margin not lobulate either side of middle.

Mesopleuron: Faintly concave, evaporatorium extensive, covering most of segment, reaching lateral and posterior margins; posterior margin entire; mesosternum prominent and subcarinate along midline, with numerous hairs.

Metapleuron (fig. 91): Nearly flat, evaporatorium reaching almost to lateral margin; peritreme very long, reaching nearly to lateral margin of evaporative area, formed as an open trough for basal two-thirds, apical third a large, recurving, polished lobe; osteole opening at base of trough.

Legs: Moderately long; anterior tibia (fig. 121) moderately widened, with seven stout, blunt spines dorsally, not prolonged beyond tarsal insertion; tarsal II shortest; middle and posterior tibiae terete; latter (fig. 143) straight, little more than half as long as body, without spines on posterior face.

Sternites: Convex, impunctate, alutaceous, dull laterally, shining along broad median area.

Terminalia: Male genital capsule opening dorsally; gonostylus as figured for species (fig. 196).

Type of genus.—*Macroporus repetitus* Uhler (1877, p. 375), monobasic.

Distribution.—The range of this genus is that of its only included species and appears confined to the western United States, in California (and New Mexico, Torre Bueno, 1939). The specimen (USNM) which Uhler (1876, p. 278) reported from "the vicinity of Baltimore" bears the label "Md." The specimen is of the present species but is undoubtedly mislabeled as no other specimens have been reported from the eastern United States. Therefore, unless supported by additional captures, that record should not be included in the range of the genus.

Discussion.—This genus contains a single species, which is treated below.

Macroporus repetitus Uhler

PLATE FIGURES 9, 30, 91, 121, 143, 196

Macroporus repetitus Uhler, 1876, p. 278; 1877, p. 375; 1886, p. 3.—Signoret, 1881b, p. 329, pl. 10, fig. 46.—Lethierry and Severin, 1893, p. 64.—Banks, 1910, p. 100.—Van Duzee, 1917, p. 19.—Torre Bueno, 1939, p. 178.

DIAGNOSIS.—This is the only species known in this well-marked genus.

DESCRIPTION.—MALE:

Head: Length nearly three-fourths width, 0.64(0.58–0.70):0.89 (0.83–0.98); interocular width, 0.63(0.60–0.68); juga as long as clypeus, narrowing it apically; juga and vertex with numerous, irregularly placed punctures; ocelli small, separated from eye by a space almost three times transverse ocellar diameter; jugum ventrally and maxillary plate impunctate. Antennal segments: I, 0.20(0.17–0.23); II, 0.13(0.12–0.14); III, 0.27(0.24–0.29); IV, 0.27(0.23–0.31); V, 0.33 (0.32–0.34). Bucculae low, height about half of labial II. Labial segments: I, 0.31(0.30–0.33); II, 0.48(0.46–0.50); III, 0.39(0.36–0.43); IV, 0.26(0.26–0.29).

Pronotum: Length a little more or less than half of width, 1.0 (0.90–1.17):2.02(1.82–2.28); anterior lobe polished, moderately punctured except for U-shaped discal area, punctures slightly coarser towards margins; posterior lobe with numerous close-set punctures similar to those of transverse impression.

Scutellum: Distinctly wider than long, 1.34(1.17–1.49):1.02(0.90–1.10); surface, except basal angles, moderately closely punctured almost to apex, latter with a low, median carina.

Propleurae, mesopleurae, and metapleurae: As described for genus.

Legs, sternites, and terminalia: As described for genus, gonostylus as illustrated (fig. 196).

Length of body: 3.74(3.35–4.12).

FEMALE.—Very similar to male, but punctures of posterior pronotal lobe a little coarser and more distinct; and measurements more variable.

Head: Length-width ratio, 0.64(0.55–0.68):0.92(0.80–1.00); interocular width, 0.65(0.56–0.72). Antennal segments: I, 0.21(0.17–0.26); II, 0.13(0.13–0.16); III, 0.28(0.25–0.33); IV, 0.29(0.26–0.33); V, 0.33(0.27–0.37). Labial segments: I, 0.34(0.32–0.38); II, 0.52 (0.44–0.60); III, 0.40(0.34–0.51); IV, 0.28(0.27–0.31).

Pronotum: Length-width ratio, 1.08(0.84–1.19):2.11(1.75–2.28).

Scutellum: Width-length ratio, 1.36(1.07–1.56):1.10(0.91–1.19).

Length of body: 4.02(3.42–4.35).

TYPE DATA.—Uhler (1876, p. 278) reported the type "From the vicinity of San Francisco." The other locality given in the original

description, "in the vicinity of Baltimore," is undoubtedly in error, probably resulting from mislabeling, as the specimen is still in the Uhler collection (USNM). No subsequent specimen has been labeled for the eastern United States.

SPECIMENS STUDIED.—28 males, 49 females.

UNITED STATES: *California:* Camp Baldy, Carmel, Greenhorn Mts. in Tulare Co., Independence, Monterey, Mt. Diablo, Mt. Wilson, Paraiso Springs, Pinnacles National Monument, Riverside Co., San Diego Co., San Francisco, San Jacinto Mts., Sequoia National Park, Suisun, Tan Bark Flat, Yuba City; October to June.

DISCUSSION.—Ecological data on specimens consisted of the phrase "in soil" on a series consisting of one adult and three young instars, and one note of "*Ceanothus.*" Torre Bueno (1939) listed the species from New Mexico.

Genus *Microporus* Uhler

Microporus Uhler, 1872, p. 394 (name only); 1876, p. 275.

DIAGNOSIS.—The very strongly restricted metapleural evaporatorium that just outlines the peritreme marks this genus as distinct from the others in the Western Hemisphere.

DESCRIPTION:—Small, 3.5–5.2, broadly roundly oval, greatest width slightly posterior to midlength; dorsum moderately, venter strongly convex.

Head: Length about three-fourths width; oblique, slightly to decidedly convex above; clypeus almost or quite as long as juga, both with fine marginal carina dorsally and a sunken submarginal line with coarse contiguous setigerous punctures bearing short blunt pegs and several long hairs; eyes well developed but small, projecting; ocelli well developed, moderate in size, separated from eyes by space distinctly more than the transverse ocellar width; antennae 5-segmented, IV and V subequal in length, stoutest; bucculae low, reaching almost to base of head; labium almost or quite reaching middle coxae, II longest, weakly compressed, without semicircular foliaceous lobe, I and III subequal, longer than IV.

Pronotum: Almost half as long as wide; side margins carinate, narrowing from base, basal half or more straight, with a submarginal row of six or seven or a submarginal band of numerous setigerous punctures; anterior margin moderately, simply emarginate; posterior margin broadly, weakly convex; angles rounded.

Scutellum: As wide as or slightly wider than long, triangular, apex broadly rounded, not or very feebly narrowed; apex about two-thirds of membranal suture; disc abundantly punctured.

Hemelytron: Corial areas well defined, moderately punctured over entire surface; costa with 20 or more setigerous punctures; membranal

suture straight or bisinuate; membrane about two-fifths of hemelytral length, yellow or milky hyaline.

Propleuron: Polished, impunctate; prosternal carinae low; anterior margin broadly and weakly lobed on either side of middle.

Mesopleuron (fig. 90): Slightly concave, shining, evaporatorium very limited or absent and replaced by rough, close, oblique rugae on inner basal half; posterior margin entire; mesosternum carinate medially, with numerous long hairs.

Metapleuron (fig. 90, *a–d*): Rather convex, shining, evaporatorium restricted to simple outline of peritreme and may become evanescent apically, remainder of surface shining, weakly rugose or with few punctures; peritreme reaching almost to or slightly past middle of segment; terminal modification strongly to weakly auriculate (figs. 90,*a–d*) always with anterior part extended posteriorly around osteolar opening which is visible ventrally.

Legs: Short; anterior tibia (fig. 118) moderately dilated, with seven or eight stout, blunt spines on dorsal margin, not prolonged beyond tarsal insertion; tarsal II shortest; middle and posterior tibiae subterete, latter (fig. 151) straight, dorsal and ventral spines equal in size.

Sternites: Convex, polished, wrinkled and more or less punctured, each segment with transverse row of setigerous punctures approaching posterior margin toward middle; each segment laterally with submarginal elevated band which gives rise to two or more than twelve long hairs per segment.

Type of genus.—*Microporus obliquus* Uhler (1872, p. 394), monotypy.

Distribution.—Two species of this genus are known to occur throughout the entire United States (but only from scattered localities in the eastern half) and south to central Mexico; the third only from Argentina in South America.

Discussion.—The division of the genera of the Cydninae into two groups based upon the absence or presence of a differentiated terminal part of the peritreme has proved to be very workable in nearly all cases. The "exception" proves to be in the present genus—*Microporus*. In the original description of the *Microporus*, Uhler (loc. cit.) said, "Osteolar canal short, at tip enlarged into a circular auricle." He described two species in this genus, *obliquus*, the genotype, and *testudinatus*. Several years later, Distant (1880, p. 8), after quoting Uhler's statement concerning the "circular auricle," described a third species, *mexicanus*. From all this one would assume that the circular auricle was a characteristic of all three forms. The first clue that such was not always the case appeared in Signoret's (1881b) introductory remarks concerning Uhler's genera. At that time Signoret (1881b) transferred *testudinatus* to *Aethus* (defined on p. 423 as having

"le canal ostiolaire terminé par un lobe de formes diverses, libre a l'extrémité ou plus ou moins confondu avec la suture mésosternale") and in 1882 he transferred *obliquus* to *Cydnus* (defined on p. 145 as having "a l'extrémité du canal ostiolaire un lobe libre, plus ou moins surelévé, en forme de cornet et plus ou moins aplati sur les côtés"). From specimens which Uhler apparently furnished him, Signoret illustrated the greatly reduced terminal modification of the osteolar pattern in *testudinatus* and the auricular development of the same structure in *obliquus*. Since that time, authors have treated these species as members of the genus *Aethus* or *Cydnus* depending on how the latter taxon was defined.

With the intense examinations of the present study the specimens assigned here appeared to stand apart from all others in the Western Hemisphere. And again they appeared to be best defined as Uhler had done, but with a limiting statement concerning the shape of the terminal process of the peritreme. In the more than 200 specimens examined, the shape of the terminal process of the peritreme proved to be somewhat variable but exhibited two general types. The first type was large and loop-shaped with the osteole opening ventrally at its base (fig. 90,a). The second type showed more variability but was essentially the loop-shape greatly reduced and somewhat compressed, but still with the osteole opening ventrally at its base (figs. 90,b–d). The latter, or reduced type, was found almost exclusively on a series of specimens from the coastal regions of central California (see distribution notes under *testudinatus*); while the loop-shaped type was found on specimens from all parts of the range of the genus, even in the central coastal area of California.

Additional support for keeping *Microporus* as a distinct genus is offered by features other than the peritreme. The very limited metapleural evaporatorium appears unique and by itself could be relied upon to separate this genus from all other Cydninae in the Western Hemisphere. The combination of a complete, submarginal row of pegs on the juga and the unnarrowed apex of the scutellum, which is broader than half the length of the membranal suture, appears in no other species of the New World except in the *brevis* section of the genus *Tominotus*.

With the genus thus tentatively established, attention must be directed to the three nominal species described within *Microporus*. At the specific level the student of this group is again beset by the same problem—exceeding variability of characters, even those that might be considered critical for separating species. Considering first Uhler's two species, *obliquus* and *testudinatus*, one gathers from the literature that both an eastern and a western species, respectively, are represented. Attempts to separate the two on the basis of

published treatments lead to confusion and uncertainty because *obliquus* shows such extreme variation that one is easily led to believe that but a single variable species is involved. I am not yet fully convinced otherwise, but simply retain the two forms because sufficient evidence is not at hand to synonymize a long-established name. Additional specimens, especially from California, should decide the matter. The separating character accepted in the present study is that furnished by the development of the terminal lobe of the peritreme. The large loop- or ear-shaped lobe is accepted as the diagnosis for *obliquus*, while the reduced lobe marks the distinctness of *testudinatus*. If the gap would remain evident between these two extremes the two forms could be accepted as distinct. But as indicated by figures 90,b,c, it appears that with a larger series of specimens this gap will eventually be bridged.

If *testudinatus* is accepted as being delimited by the reduced peritreme lobe, it appears to be rather uniform in shape, punctation, and coloration of the membrane. But all features for which *testudinatus* was examined fell within the great range of variability exhibited by *obliquus* (see specific discussion of variability for this form). The confusion caused by this variability also misled Uhler, who labeled a specimen of *obliquus* as *testudinatus*. This specimen does show the proper habitus for *testudinatus*, but has the loop-shaped lobe on the peritreme and a ventral truncation of the prosternal carinae and lacks the membranal markings. Recourse to the male gonostylus resulted in no help. In the more than 20 specimens examined, the gonostyli of no two were alike. The series of accompanying outline drawings (figs. 197,*a,b*; 198,*a–f*) demonstrates some of the variability in the shape of this structure.

Distant's (1880, p. 8) species, *Microporus mexicanus*, appears to be *obliquus* for three reasons: (1) The generic characterization quoted Uhler's description of the "circular auricle," while the specific description said nothing about *mexicanus* disagreeing on this point (assuming Distant verified the generic features occurring on the ventral surface of his specimens). (2) Distant made a comparison with *obliquus*, but the differentiating features pointed out that the punctation and wrinkling of the scutellum do not appear to have specific value in the group. In fact, transverse wrinkling appears to be a deformity that occurs often in specimens of this family; perhaps the burrowing of teneral specimens causes the still-plastic cuticula to be jammed into folds. (3) The type locality falls within the range of *obliquus* as accepted here.

Therefore, at present I recognize as valid within this genus only Uhler's two species and, on the basis of its auriculate peritreme, Berg's *Cyrtomenus nigropunctatus*.

Key to the species of *Microporus*

1. Pronotum laterally with six to seven and costa with four setigerous punctures; color yellow with dorsal punctures and maculae fuscous to black. **nigropunctatus** (Berg) (p. 401)
   Pronotum laterally and costa with numerous (20 or more on each) setigerous punctures; color piceous to black 2
2. Osteolar peritreme terminating in a large loop- or ear-shaped process (fig. 90,*a*). . . . . **obliquus** Uhler (p. 402)
   Terminal loop of osteolar peritreme smaller (figs. 90,*b-d*). **testudinatus** Uhler (p. 405)

Microporus nigropunctatus (Berg), new combination

Cyrtomenus nigropunctatus Berg, 1879, p. 12.
Cydnus nigropunctatus Signoret, 1882, p. 145, pl. 6, fig. 64.—Lethierry and Severin, 1893, p. 67.

Diagnosis.—The wholly yellow color with fuscous punctures and maculae is unique within the family.

Description.—Based on a single specimen. Female: Oval, widest behind middle.

Head: Wider than long, 1.28:1.02; interocular width 0.40; free margin semicircular. Antennal segments: I, 0.26; II, 0.30; III, 0.28; IV, 0.32; V, 0.34. Surface shining, with numerous close-set coarse rugae radiating from base of clypeus, numerous finer, irregular, transverse rugae between ocelli. Labial segments: I, 0.48; II, 0.62; III, 0.48; IV, 0.40.

Pronotum: Length almost half of width, 1.24:2.64; surface, except on and between calli, with numerous distinct punctures crowded into short, irregular, transverse rows on disc and becoming finer laterally; transverse impression obsolete; side margins with six or seven setigerous punctures, only two of these posterior to transverse impression.

Scutellum: As long as broad, 1.60:1.60; surface, except basal angles, with minute, longitudinal rugae between the irregularly scattered distinct punctures, latter absent basally.

Hemelytron: Corial areas well-defined; irregularly alutaceous; exocorium less distinctly punctured than mesocorium, latter with single row of punctures paralleling claval suture; clavus alutaceous with two longitudinal rows of punctures; costa with four setigerous punctures; membranal suture nearly straight, lateral angle rectangular; membrane longer than basal width.

Propleuron: Weakly alutaceous, virtually impunctate; prosternal carinae moderately thick, low.

Mesopleuron: Evaporatorium forming narrow band around peritreme and becoming evanescent apically; lateral area polished to weakly alutaceous.

Venter: Lateral third finely and rather irregularly rugulose; each segment with one or two submarginal setigerous punctures.

Length of body: 4.08.

Color: Dorsally and ventrally light yellow; spines fuscous to black; dorsal punctures fuscous, becoming paler laterally on head, thorax, and coria; following areas distinctly clouded with fuscous: Occiput, calli, basal angles and apical margin of scutellum, inner base of clavus, lateroapical angle of mesocorium, and broad, lateral areas on mesopleuron and metapleuron.

Type data.—Berg's (1879, p. 12) pair of specimens (Univ. Nac., fide Kormilev, in lit.) was from "Mendoza," Argentina.

Specimens studied.—1 female.

Argentina: Santiago del Estero to Río Hondo, Feb. 14, 1948, R. Golbach, 1 female (UnivTuc).

Discussion.—This species stands alone among all others of the Western Hemisphere in its color.

The inclusion of *nigropunctatus* in *Microporus* might come as a surprise, especially in view of its range being so distant from those of its congenitors. However, if the sculpture of the peritreme can be used as a phylogenetic indicator the auriculate development here definitely allies this form with the northern ones. The greatly reduced lateral pubescence separates it rather markedly and suggests the possible need for subgeneric recognition. But I am hesitant about erecting supraspecific taxa in the Cydnidae on the basis of vestiture alone, especially for just one or two species, and so refrain from it here.

Microporus obliquus Uhler

Plate figures 8, 28, 29, 90a, 118, 151, 198

Microporus obliquus Uhler, 1872, p. 394; 1877, p. 373.—Stål, 1876, p. 27.—Signoret, 1882, p. 161, pl. 7, fig. 97.

Microporus mexicanus Distant, 1880, p. 8, pl. 4, fig. 8. New synonymy.

Cydnus obliquus Signoret, 1882, p. 161.—Uhler, 1886, p. 3.—Lethierry and Severin, 1893, p. 67.—Banks, 1910, p. 99.

Cydnus mexicanus Signoret, 1882, p. 241.—Uhler, 1886, p. 3.—Lethierry and Severin, 1893, p. 67.

Aethus obliquus Van Duzee, 1917, p. 20.

Aethus (*Microporus*) *obliquus* Torre Bueno, 1939, p. 179.

Diagnosis.—*M. obliquus* is characterized within the genus by possession of a large, loop- or ear-shaped process on the peritreme (fig. 90,a) and the piceous color.

Description.—Male: Broadly oval.

Head: Length more than two-thirds width, 0.84(0.72–0.96): 1.13(1.00–1.26); interocular width, 0.80(0.71–0.91); anterior outline a flattened semicircle, juga slightly longer than clypeus; dorsum shining, with radiating rugae and few to many punctures; juga ventrally and

maxillary plate polished, impunctate. Antennal segments: I, 0.21 (0.20–0.23); II, 0.14(0.11–0.18); III, 0.20(0.19–0.23); IV, 0.20(0.16–0.23); V, 0.22(0.20–0.25). Labium reaching bases of middle coxae. Labial segments: I, 0.39(0.36–0.46); II, 0.50(0.43–0.53); III, 0.38 (0.33–0.44); IV, 0.30(0.26–0.36).

Pronotum: Length less than half width, 1.18(0.99–1.32):2.38 (2.11–2.69); anterior margin moderately, singly emarginate; lateral margin straight on basal two-thirds or more; lateral margin entire, not emarginate, with submarginal stripe of numerous setigerous punctures; transverse impression weak to absent, postmedian, without a row of coarser punctures; anterior lobe distinctly but variably punctate only subapically and laterally; posterior lobe sparsely and finely punctured to coarsely and closely punctured.

Scutellum: Little wider than long, 1.58(1.36–1.75):1.45(1.25–1.65); surface shining, feebly or not wrinkled, punctures sparse across narrow base, extending to apex.

Hemelytron: Clavus and corium obsoletely alutaceous; corium uniformly punctured over most of surface; costa with more than 25 setigerous punctures; membrane slightly longer than basal width, immaculate or patterned, pattern consisting either of a median fuscous dot or median fuscous dot with apical half infuscated.

Propleurae, mesopleurae, and metapleurae: As in generic description, latter with lobe of peritreme loop- or ear-shaped, with osteole opening ventrally at its base (fig. 90,*a*); lateral area polished, usually with few scattered punctures mesally.

Legs: As in generic description.

Terminalia: Genital capsule distinctly punctate laterally, apical margin feebly sinuate either side of middle; gonostylus variable in shape (figs. 198,*a-f*).

Length of body: 3.98(3.66–4.47).

Female: Similar to male, measurements averaging larger.

Head: Width-length ratio, 1.23(1.13–1.34):0.92(0.84–0.97); interocular width, 0.88(0.80–0.95). Antennal segments: I, 0.23(0.21–0.26); II, 0.15(0.13–0.17); III, 0.21(0.20–0.24); IV, 0.21(0.20–0.26); V, 0.22(0.20–0.29). Labial segments I, 0.40(0.37–0.43); II, 0.51(0.50–0.53); III, 0.40(0.37–0.44); IV, 0.33(0.30–0.37).

Pronotum: Length-width ratio, 1.30(1.21–1.49):2.64(2.43–2.93).

Scutellum: Length-width ratio, 1.66(1.49–1.82):1.73(1.61–1.89).

Length of body: 4.45(4.04–5.01).

Type data.—The type (USNM) is from "Ogden, Utah."

Specimens studied.—70 males, 118 females.

United States: *Arizona:* Chiso Valley, Phoenix, Tuba City, Winslow, St. Johns; July, August. *California:* Altamont, Amadee, Anaheim, Antioch, Burlingame, Davis Co., Fairfax, Lagunitas, mountains west of La Panza, Los

Angeles, Manhattan Beach, Modesto, Pasadena, Point Arena, Plumas Co., 3 miles south of Olancho, Rio Vista, Riverside, Seal Beach, Sequoia National Park, Truckee; March to September. *Colorado:* Colorado Springs, Denver, Fort Collins, Fountain Valley, Manitou, Power Co.; June, August. *Idaho:* Hansen, Murtaugh, Twin Falls; May and June. *Illinois:* Havana, Oregon; May, June. *Indiana:* Pine; May. *Iowa:* Iowa City, Lake Okoboji; May to September. *Kansas:* Clark Co., Dodge City. *Louisiana*: Bassier; February. *Missouri:* St. Louis; June. *Nevada:* Humboldt Lake; August. *New Mexico:* Albuquerque, Scholle, Estancia, Torrance Co., Tucumari, Vaughn, Willard; June to September. *Oklahoma:* Alva, Stillwater; April, May. *Oregon:* The Dalles, Umatilla; May, June. *South Carolina:* Charleston; March. *South Dakota:* Chester, Hecla; June. *Texas:* Amarillo, Austin, Katherine, Somerset, Tyler, Uvalde, Valentine; February to June, September to December. *Utah:* Ogden, Provo; June. *Virginia:* Cape Henry; June. *Washington:* Vantage; April.

Mexico: *Coahuila:* Torreón. *Durango:* Durango. *Guanajuata:* "Gazales Jct.," San Miguel Avende; August. *Hidalgo:* Zimipán; November. *Sonora:* Los Alamos, Guaymas; August.

Discussion.—The extreme variability exhibited by this species has been most confusing. This variability is evident on most parts of the body. The head may be weakly (fig. 29) to strongly convex (fig. 28) with the part within the submarginal row of setigerous punctures being abruptly or gradually tumid; the surface may have weak to strong radiating rugae and may be virtually impunctate, with few scattered punctures or with crowded close punctures. The pronotum varies in degree of narrowing of the sides, in the number and size of punctures and in shape of prosternal carina which may (fig. 29) or may not be truncated ventrally. The scutellum and hemelytra likewise vary in surface sculpture. The membrane may be immaculate or patterned as described above. The general shape may be from broadly oval to very broadly oval or almost rounded in outline. With such variability to evaluate, one wonders whether one or several species are involved here, and whether or not this species may actually encompass the form maintained in the present paper as *testudinatus!* With more time and material available for study the answer may become evident, but at present decisions are only tentative.

Reports by Hart (1919) and Stoner (1920) indicate that this species is normally an inhabitant of the roots of various plants growing in sandy areas. Notes on some of the specimens examined during this study confirm the sandy habitat with such remarks as "sand," "sand area," or "sand dune." Occasional specimens likewise bore a record of the plants with which they were associated, as follows: Cantaloupe in Arizona, *Amsinkia* roots and *Ceonothera cheiranthefolia* in California, and *Hudsonia* in Virginia. Stoner (loc. cit.) gave additional notes on the habits of this species in Iowa, reporting that adults were present in spring and that nymphs outnumbered adults during the summer months. He reported an interesting observation in

which specimens were seen to be clutching a seed against the body with the middle legs.

Microporus testudinatus Uhler

PLATE FIGURES 90*b–d*, 197

Microporus testudinatus Uhler, 1876, p. 276; 1877, p. 374; 1886, p. 3.—Distant, 1880, p. 8, pl. 2, fig. 24.

Aethus (*Microporus*) *testudinatus* Signoret, 1881b, p. 424, pl. 11, fig. 53.—Torre Bueno, 1939, p. 179.

Aethus testudinatus Uhler, 1886, p. 3.—Van Duzee, 1917, p. 20.

Cydnus testudinatus Lethierry and Severin, 1893, p. 68.

DIAGNOSIS.—The small size of the apical lobe of the peritreme separates this species from the other member of the genus.

DESCRIPTION.—MALE: Broadly to very broadly oval.

Head: Length about two-thirds width, 0.82(0.80–0.83):1.14(1.13–1.16); interocular width, 0.85(0.83–0.90); anterior outline a strongly flattened semicircle, juga slightly longer than clypeus; surface shining, feebly rugae, with small punctures, somewhat tumid just mesad or submarginal row of punctures; juga ventrally and maxillary plate impunctate. Antennal segments: I, 0.26(0.24–0.28); II, 0.14(0.13–0.16); III, 0.19(0.19–0.20); IV, 0.20(0.20–0.20); V, 0.20(0.20–0.20). Bucculae slightly lower than labial II, evanescent posteriorly; labium reaching between middle coxae. Labial segments: I, 0.41(0.40–0.43); II, 0.52(0.48–0.56); III, 0.41(0.40–0.44); IV, 0.28(0.26–0.30).

Pronotum: Length less than half of width, 1.15(1.14–1.17):2.47(2.40–2.55); anterior margin deeply and singly emarginate; lateral margins entire, not emarginate, submarginal setigerous punctures very numerous, arranged in a narrow stripe (not in a single row); transverse groove behind middle, absent medially and faintly indicated laterally; anterior lobe distinctly punctured only subapically and laterally; posterior lobe punctured, finely so on disc and more coarsely so laterally.

Scutellum: Wrinkled, punctures absent at base and becoming progressively coarser and much more numerous to apex.

Hemelytron: Corium distinctly convex, areas well defined; disc with a single, sunken row of close-set punctures paralleling claval suture, elsewhere sparsely punctured; exocorium more densely punctured; costa with 25 or more setigerous punctures; clavus with two longitudinal rows of punctures; membranal suture almost straight, rectangular at outer angle; membrane usually short, about as long as basal width.

Propleuron: Impunctate; prosternal carinae very low, thick, evanescent ventrally.

Mesopleuron: Lateral area sparsely rugopunctate.

Metapleuron: Osteolar peritreme reaching half way across segment, terminal process variable (fig. 90,*b-d*), curved into small auricle with osteole opening ventrally at base; anteroapical angle prolonged along mesosternal suture as evanescent projection; lateral area polished, with a number of obsolete to strong punctures.

Legs: As in generic description.

Terminalia: Genital capsule distinctly punctate laterally, margin slightly flaring, apical margin weakly sinuate either side of middle; gonostylus variable in shape (figs. 197a,b).

Length of body: 3.94(3.85–4.04).

Female.—Very similar to male, but measurements averaging larger.

Head: Length-width ratio, 0.87(0.83–0.90):1.21(1.16–1.28); interocular width, 0.91(0.86–0.96). Antennals: I, 0.24(0.23–0.26); II, 0.15(0.14–0.16); III, 0.20(0.20–0.21); IV, 0.20(0.20–0.21); labials: I, 0.42(0.41–0.43); II, 0.56(0.53–0.63); III, 0.43(0.43–0.46); IV, 0.34 (0.33–0.36).

Pronotum: Length-width ratio, 1.24(1.17–1.36):2.67(2.53–2.86).

Scutellum: Length-width ratio, 1.65(1.56–1.82):1.80(1.75–1.89).

Length of body: 4.25(4.14–4.40).

Type data.—The locality of the type specimen (USNM) was given by Uhler as "California."

Specimens studied.—13 males, 20 females.

United States: *California:* Asilomar, Carmel, Dillon Beach (Marin Co.), Monterey Co., Pacific Grove, Plumas Co., Point Arena, San Francisco, Santa Cruz, Sea Side, Sonoma Co.; February, April to September.

Mexico: "S. W. Mex."

Discussion.—All named California specimens of *Microporus* that were studied bore the determination of *testudinatus*, suggesting that locality rather than morphology was used as the delimiting factor, especially as none of the specimens from outside of California bore that determination. The Mexican specimen cited above was from the Uhler collection (USNM) and may have been the one on which he based the Mexican locality in his monograph. All other Mexican specimens examined during this study belonged to *obliquus*.

Genus *Cydnus* Fabricius

Cydnus Fabricius, 1803, p. 184.
Brachypelta Amyot and Serville, 1843, p. 89.

Pending completion of studies of the Cydnidae of the Eastern Hemisphere, the conclusions of China (1943) concerning this genus are here accepted without question. The decision to do this was a practical solution to a complex problem requiring review of a very extensive literature of a genus which apparently is not yet established in this hemisphere.

Diagnosis.—Among the cydnid genera occurring in the Western Hemisphere, this one may be recognized by being large (more than nine millimeters in length of body), black, and having the membranal suture very strongly bisinuate (fig. 4).

Description.—Size large, shape elongate-oval, sides subparallel; dorsum weakly convex, venter strongly so.

Head: Length more than three-fourths width; margins broadly expanded, eyes faintly or not at all projecting; juga greatly surpassing clypeus, broadly contiguous beyond it and very strongly elevated anteriorly; submarginal row of setigerous punctures on each jugum far removed from margin; clypeus with two subapical setigerous punctures; ocelli small, behind a line connecting posterior margins of eyes and separated from eyes by a space about two or more times a transverse ocellar width; juga ventrally roughened by weak rugae and weaker punctures; maxillary plate with irregularly spaced, fine tubercles; antennae 5-segmented, I shortest, II and IV subequal, longer than III or V; bucculae (fig. 21) very high, posterior end highest and abruptly, perpendicularly truncated; labium reaching onto mesosternum, I shortest, II and III usually subequal, longer than IV.

Pronotum: Length a little more than half of width; anterior margin weakly emarginate; lateral margins carinate, weakly converging from base to apical third, thence broadly rounded to anterior angles; posterior margin nearly straight across width of scutellum, then depressed and slightly lobulate before curving obliquely forward laterally; all angles rounded; transverse impression submedian, broad and shallow; anterior lobe of male strongly inflated across middle three-fifths of posterior third, thence abruptly declivitous to anterior margin; anterior lobe of female without such elevation; posterior lobe in both sexes only slightly convex.

Scutellum: A broad, short, triangle, base and side margins subequal in length; sides strongly and abruptly declivitous, virtually perpendicular on basal half or more; apex narrowed, acute.

Hemelytron: Corial area, except costa, well defined; membranal suture distinctly bisinuate, sinuation accentuated by black basal margin of milky membrane; membrane longer than basal width, surpassing apex of abdomen.

Propleuron: Convexities and depression with numerous close-set small tubercles and some closely associated punctures; prosternal carinae low, thick, obscured by heavy punctation; anterior margin very weakly expanded either side of middle.

Mesopleuron: Surface irregular, strongly impressed laterally; evaporatorium limited; lateral area coarsely rugopunctate; meso-

sternum somewhat swollen, carinate along midline, with numerous long hairs.

Metapleuron: Weakly convex; terminal process of peritreme large, elongate-oval, surface alutaceous but shining, with one to three longitudinal or oblique sharp rugae (fig. 89); evaporatorium extensive, distinctly surpassing apex of peritreme and reaching almost to posterior coxae; lateral area with numerous coarse, rugose punctures.

Legs: Moderately long; anterior tibia (fig. 116) not surpassing tarsal insertion, strongly compressed, dorsal margin with eleven spines; middle and posterior (fig. 139) legs with tibia terete; tarsal II little shorter than I, III longest.

Sternites: Strongly convex, punctured, laterally more coarsely punctured and with numerous small tubercles; posterior margin of each segment finely denticulate or crenulate.

Terminalia: Male genital capsule opening dorsally, apical rim feebly flared.

Type of genus.—*Cydnus tristis* Fabricius (1803, p. 195), by subsequent designation by Blanchard "(1844, p. 505)" (vide China, 1943, p. 220); Fabricius' name is a synonym of *Cimex aterrimus* Forster (1771, p. 71). The type of *Brachypelta* is *Cydnus tristis* Fabricius (loc. cit.), monobasic. Thus, because *Brachypelta* has the same type as does *Cydnus*, it is a synonym by isogenotypy.

Distribution.—The single species of the genus *Cydnus* is a Palearctic form which, according to Oshanin (1912), occurs in all the major zoogeographical regions of the Old World. The present records of it in the Western Hemisphere probably represent introductions rather than a part of the permanent range.

Discussion.—The occurrence of the single species of this genus in the Western Hemisphere came as a surprise. Although the author prefers to consider these records as accidental introductions and not indications of established population, he believes that if the latter does prove to be true this information will be useful.

Cydnus aterrimus (Forster)

Plate figures 4, 21, 89, 114, 116, 139, 167, 172, 186, 200

Cimex aterrimus Forster, 1771, p. 71.
Cimex tristis Fabricius, 1775, p. 716.

Diagnosis.—This is the only species known to belong to the genus *Cydnus*.

Description.—Based on two males. Male: Elongate-oval, sides parallel.

Head: Length four-fifths width, 1.71(1.63–1.79):2.02(1.96–2.08); interocular width, 1.43(1.36–1.50); anterior outline more than a semicircle, broadly V-marginate at apex; juga much surpassing and

broadly contiguous beyond apex of clypeus; surface concave, mostly shallowly rugopunctate; jugum with six submarginal setigerous punctures; jugum ventrally and maxillary plate weakly to strongly rugopunctate. Antennal segments: I, 0.48(0.47–0.50); II, 0.80(0.78–0.83); III, 0.68(0.66–0.70); IV, 0.83(0.83–??); V, 0.90(0.90–??). Labium reaching base of mesosternum. Labial segments: I, 0.53 (0.53–0.53); II, 0.91(0.90–0.93); III, 0.91(0.90–0.93); IV, 0.56(0.53–0.60).

Pronotum: Length more than half of width, 3.11(3.03–3.20):5.51 (5.44–5.59); laterally with submarginal row of 10 to 12 setigerous punctures; transverse impression median, shallow, broad and distinct, without a row of coarser punctures; anterior lobe elevated anterior to transverse impression, thence abruptly declivitous to apex in middle third, broad anterior and lateral margins closely and moderately punctate; posterior lobe laterally with continuation of punctation of anterior lobe, discally (especially in transverse impression) with numerous intermixed moderate and minute punctures and fine longitudinal rugulae.

Scutellum: Length about two-thirds width, 2.64(2.60–2.69):3.60 (3.56–3.65); surface, except oblique area in basal angles, with crowded intermixed moderate and minute punctures and fine longitudinal rugulae.

Hemelytron: Clavus and corium alutaceous; clavus with two very irregular rows of punctures; mesocorium with crowded small punctures, some arranged in two more or less distinct rows paralleling claval suture; exocorium more densely punctate than mesocorium; costa without setigerous punctures. Remainder as in generic description.

Terminalia: Gonostylus as illustrated (fig. 200).

Length of body: 11.25(10.90–11.63).

Type data.—The type was described from "Hispania ad fretum Gaditanum." It has not been located.

Discussion.—The occurrence of this species in the New World was not suspected by the author. However, since it is such a common species around many ports of Europe and other parts of the Old World, there appears no reason to doubt that adults could easily fly to lights on the boats and unwittingly accompany the vessels anywhere in the world. At present the author prefers to consider these records as accidental introductions and not representatives of established populations. But perhaps additional collecting in these areas will prove otherwise, in which case the included data will be helpful.

Comparison of these two specimens with material from the Mediterranean area leaves no doubt about the identity of them. The females,

however, differ from the males in that the anterior lobe of their pronotum is low and gently convex, not elevated and declivitous.

Specimens examined.—2 males.

United States: "Ala.?" (HMH).

West Indies: "Tobago, 1–4, ii, 1931. Capt. A. K. Totton. B.M. 1931–183" (BrM).

Genus *Ectinopus* Dallas

Ectinopus Dallas, 1851, p. 121.

Diagnosis.—The large, blackish membrane which occupies about one-half of the hemelytral length permits ready recognition of this genus.

Description.—Large (11.3–14.2), elongate-oval, greatest width approximately at midlength; dorsum slightly convex, venter much more strongly so; body surface dorsally and ventrally and corium distinctly alutaceous.

Head: Length more than half of width, flattened above; clypeus as long as juga; latter with anterior margin nearly or quite semicircular, not or vaguely reflected at edge, without submarginal row of setigerous punctures; eyes large, entire, slightly projecting; ocelli well developed, moderate in size, situated on a line connecting hind margins of eyes, separated from eyes by about twice an ocellar width; with two primary setigerous punctures, one near inner angle of eye, one subapically on jugum (fig. 66); antennae 5-segmented, I shortest, V usually longest; bucculae moderately high, reaching almost to base of head; labium reaching between or slightly beyond middle coxae, IV shortest, II longest, slightly compressed and without a foliaceous lobe, III longer than I (fig. 22).

Pronotum: Nearly twice as broad as long, narrowed anteriorly, side margins carinate, slightly coarctate, with submarginal row of 5 to 7 setigerous punctures; transverse impression slightly postmedian, weak or obsolete, variously punctured; front margin shallowly and evenly concave; posterior margin slightly and broadly convex; all angles rounded.

Scutellum: As wide as or slightly wider than long, strongly triangular; apex narrowed, acute, sides flattened; disc more or less punctured; width of apex about one-third of membranal suture.

Hemelytron: Corial areas well defined; membranal suture straight, lateral angle acutely prolonged; corium with rather uniform, scattered punctures, these a little denser on exocorium; costal margin usually with a single subbasal setigerous puncture; membrane about half the hemelytral length, translucent brownish black.

Propleuron: Depression moderately punctate; prosternal carinae low, rounded; anterior margin of prosternum with a broad, short lobe either side.

Mesopleuron (figs. 100, 101): Flat, with a strong, oblique, rugopunctate groove anterior to evaporatorium; latter extensive, reaching to posterolateral angle; posterior margin crenulate; mesosternum prominent and subcarinate along midline, with numerous hairs on apical half.

Metapleuron (figs. 100, 101): Nearly flat, evaporatorium occupying mesal two-thirds of segment; lateral polished area punctate near evaporatorium; osteolar peritreme extending less than half way across segment; anterior part of peritreme curved posteriorly around osteolar opening which is visible ventrally (figs. 100, 101), posterior apex narrowly polished.

Legs: Long, slender; anterior tibia (fig. 126) only moderately widened, 8 to 9 stout, sharp spines dorsally, apex not prolonged beyond tarsal insertion; middle and hind tibiae slender, latter (fig. 145) about half as long as body, slightly curved in apical half, margins uniformly spined.

Sternites: Strongly convex; each segment with a broad, lateral area of shallow punctures; segment VI sometimes modified medially on posterior margin in females (see "discussion" below).

Terminalia: Male genital capsule very broadly, shallowly emarginate; ventral plates of female convex, flat or convex, sternite VI variously or not modified (figs. 182, 183).

Three fifth-instar nymphs were available for study. These showed the sparse lateral setigerous punctures of the head and body and the long, terete, posterior tibia of the adult. They differed from adults in possessing a weak, submarginal primary setigerous puncture anterior to the eye. In color they were quite striking. The head, thorax and appendages were the usual brownish black color, but the abdomen was very bright red with the dorsal and lateral plates black. The eyes, also, were brilliant red.

Type of genus.—*Cydnus holomelas* Burmeister (1835), monobasic.

Distribution.—The general range of *Ectinopus* extends from Mexico south to Bolivia and Brazil.

Discussion.—The three species of this genus are structurally very similar, allowing most of the physical features to be incorporated into the generic description. One structural feature, however, merits additional comment—the modification of the sixth sternite which occurs in the females. This modification of the middle of the posterior margin of the segment forms a progressive series from no modification in the new species *muticus*, through a polished, flattened, transverse area in *rugoscutum* (fig. 183) to a deep excavation between a pair of prominent, blunt tubercles in *holomelas* (fig. 182).

Key to the known species of *Ectinopus*

1. Antennal III less than three-fourth (70%) as long as II.
   muticus, new species (p. 413)

   Antennal III at least four-fifths as long as II 2

2. Head with numerous (15 or more) moderate punctures on either side anterior to ocellus; scutellum strongly punctured into basal fourth, sunken punctures of disc confluent transversely, forming transverse rugae (fig. 66).
   rugoscutum Signoret (p. 414)

   Head impunctate or with very few scattered, very fine punctures; scutellum virtually devoid of punctures in tumid basal fourth.
   holomelas (Burmeister) (p. 412)

Ectinopus holomelas (Burmeister)

Plate figures 15, 22, 100, 126, 145, 182, 201

Cydnus holomelas Burmeister, 1835, p. 375.
Ectinopus holomelas Dallas, 1851, p. 122.—Stål, 1862, p. 96; 1876, p. 20.—Walker, 1867, p. 164.—Distant, 1880, p. 8.—Signoret, 1881b, p. 320, pl. 10, fig. 42.—Uhler, 1886, p. 3.—Lethierry and Severin, 1893, p. 64.
Aethus fusiformis Walker, 1867, p. 150.
Pangaeus ? fusiformis Uhler, 1877, p. 389.
Ectinopus opacus Distant, 1900, p. 688. New synonymy.

Diagnosis.—This species may be differentiated from its congenitors by the lack of punctures on the basal fourth of the scutellum plus the lack of an impressed line extending laterally from apex of peritreme.

Description.—Male:

Head: Length more than half of width, 1.81(1.69–1.98):2.62(2.57–2.93); interocular width, 1.63(1.49–1.69); anterior outline a shallow semicircle; surface impunctate, with a few radiating rugae submarginally. Antennal segments: I, 0.49(0.46–0.56); II, 0.88(0.80–0.97); III, 0.71(0.66–0.90); IV, 1.27(1.13–1.33); V, 1.41(1.20–1.60). Labial segments: I, 1.01(0.86–1.23); II, 1.39(1.23–1.60); III, 1.19(1.10–1.30); IV, 0.89(0.83–0.96).

Pronotum: Length slightly more than half of width, 3.23(2.87–3.44):6.14(5.72–6.49); transverse impression with an irregular band of a few, mostly widely separated punctures; anterior lobe with or without a series of punctures paralleling anterior emargination and with numerous crowded punctures laterally.

Scutellum: Usually wider than long, 3.99(3.76–4.20):3.81(3.45–4.05); discally with a scattering of a few punctures often present almost to apex.

Propleuron and mesopleuron: As in generic description.

Metapleuron: As in generic description (fig. 100), without an impressed line extending laterally from apex of peritreme.

Terminalia: Genital capsule alutaceous, with few scattered, weak punctures, apical margin not or only weakly sinuate; gonostylus as illustrated (fig. 201).

Length of body: 12.38(11.38–13.35).

FEMALE.—Similar to male but with posterior margin of sternite VI with a marked impression between two bluntly conical protuberances; measurements rather similar to those of male.

Head: Length-width ratio, 1.81(1.75–1.84):2.72(2.60–2.86); interocular width, 1.57(1.49–1.62). Antennal segments: I, 0.49(0.43–0.53); II, 0.88(0.83–0.96); III, 0.81(0.73–0.85); IV, 1.28(1.16–1.33); V, 1.33(1.16–1.46). Labial segments: I, 1.09(0.96–1.20); II, 1.42 (1.26–1.50); III, 1.21(1.03–1.30); IV, 0.89(0.80–0.96).

Pronotum: Length-width ratio, 3.15(2.99–3.45):6.11(5.86–6.65).

Scutellum: Usually longer than wide, 3.87(3.60–4.34):3.80(3.73–4.05).

Terminalia: Ventral genital plates mostly convex.

Length of body: 12.71(11.78–13.36).

TYPE DATA.—Location of Burmeister's type is unknown. It was described as from Pará, Brazil. Walker's type (BrM) was described from Orizaba, Mexico. Distant's (1900) type (BrM) was described from "Costa Rica, Helechales."

SPECIMENS STUDIED.—21 males, 18 females, 3 nymphs.

MEXICO: Isthmus of Tehuantepec (labeled *Pangaeus margo*). *Nayarit:* Tepic; March. *Sinaloa:* Mazatlán; January.

PANAMA: Alhajuelo; May. Barro Colorado Island; January. Boquete; March, June. Bugaba.

COLOMBIA: Muzo, Department of Boyacá; July.

BOLIVIA: 50 miles northeast of Cochabamba; August.

DISCUSSION.—*Aethus fusiformis* Walker has previously been assigned to synonymy here by Distant (1880, 1899) and Signoret (1881b), both of whom had examined the type in the British Museum.

The assignment of *opacus* to synonymy under *holomelas* is based on notes from Dr. China who reported that the type, a female, has the excavation between a pair of blunt tubercles on sternite VI.

Ectinopus muticus, new species

PLATE FIGURE 101

DIAGNOSIS.—Either the short, third antennal segment or the oblique, crenulate impressed line extending laterally from apex of the osteolar peritreme (fig. 101) sets this species apart from the other two in the genus.

DESCRIPTION.—Based on a single specimen. FEMALE:

Head: Length more than half width, 1.82:2.73; interocular width, 1.56; anterior outline subquadrate; surface impunctate, with a few moderate oblique rugae. Antennal segments: I, 0.50; II, 1.13; III, 0.80; IV, 1.30; V, 1.46. Labial segments: I, 1.06; II, 1.66; III, 1.33; IV, 0.76.

Pronotum: Length more than half width, 3.28:6.14; transverse impression with several widely separated punctures; in a broad irregular band; rest of surface virtually impunctate except for about a dozen punctures laterally on anterior lobe.

Scutellum: Length and width equal, 3.85:3.85; surface with several distinct, well-separated moderate punctures; apex impunctate.

Propleuron and mesopleuron: As in generic description.

Metapleuron: As in generic description, except that a deeply impressed, oblique, crenulated line extends laterally from apex of peritreme (fig. 101).

Sternites: VI unmodified along posterior margin.

Terminalia: Ventral genital plates distinctly concave.

Length of body: 12.75.

Type data.—Holotype female (USNM 64579), "Bobas, Guatemala, May, 1924, W. M. Mann."

Discussion.—In punctation the type appears somewhat intermediate between *holomelas* and *rugoscutum.* This condition led the author to consider the form as *opacus* Distant until China's notes on the types showed the latter to have the typically bituberculate sixth sternite of *holomelas.* The taxonomic worth of the impressed crenulate line extending laterally from the apex of the peritreme (fig. 101) is open to serious question in view of the fact that there was no series to indicate the extent of variability in what might prove to be an accidental cuticular fold.

The specific name alludes to the unmodified sixth sternite of the female.

Ectinopus rugoscutum Signoret

Plate figures 66, 183, 202

Ectinopus rugoscutum Signoret, 1881b, p. 319, pl. 10, fig. 41.—Lethierry and Severin, 1893, p. 64.

Diagnosis.—The numerous punctures on either side of the disc of the head and the coarsely punctured, transversely rugose scutellum will separate this species from the other two in the genus.

Description.—Male:

Head: Length more than half width, 1.93(1.75–2.08):2.83(2.73–2.99); interocular width, 1.56(1.49–1.66); anterior outline semicircular; surface of juga with moderate radiating rugae, with numerous (15 or more) fine punctures anterior to ocelli. Antennal segments: I, 0.57 (0.53–0.63); II, 0.90(0.83–0.96); III, 0.88(0.80–0.94); IV, 1.32(1.26–1.40); V, 1.48(1.43–1.54). Labial segments: I, 1.24(1.16–1.36); II, 2.04(1.66–2.26); III, 1.77 (1.46–1.89); IV, 1.16(1.03–1.20).

Pronotum: Length slightly more than half of width, 3.20(3.15–3.33):6.39(6.23–6.75); transverse impression with numerous crowded, coarse, sunken punctures; anterior lobe with a curved band of nu-

merous punctures paralleling anterior emargination; both lobes laterally with abundant, crowded punctures.

Scutellum: Wider than long, 4.10(4.00–4.33):3.87(3.83–3.91); with numerous punctures from base to near apex, these irregularly crowded, forming transverse ruga between them.

Propleuron and mesopleuron: As in generic description.

Metapleuron: As in generic description, without impressed line extending laterally from apex of peritreme.

Terminalia: Genital capsule feebly alutaceous, with few distinct punctures laterally, apical margin broadly and shallowly U- or V-emarginate; gonostylus as illustrated (fig. 202).

Length of body: 13.08(12.57–14.03).

Female: Similar to male but posterior margin of sternite VI with a shining, subapical, transverse flattened area (fig. 202), and measurements usually averaging distinctly larger than those of male.

Head: Length-width ratio, 2.02(1.95–2.05):2.99(2.95–3.08); interocular width, 1.64(1.62–1.69). Antennal segments: I, 0.55(0.42–0.63); II, 0.97(0.93–1.01); III, 0.93(0.87–1.00); IV, 1.41(1.33–1.56); V, 1.53(1.50–1.58). Labial segments: I, 1.23(1.16–1.32); II, 2.16 (2.00–2.23); III, 1.85(1.60–2.16); IV, 1.23(1.16–1.36).

Pronotum: Length-width ratio, 3.49(3.33–3.61):6.80(6.30–7.09).

Scutellum Length and width subequal, 4.27(4.08–4.35):4.28(4.06–4.35).

Terminalia: Ventral genital plates flat to gently concave.

Length of body: 13.83(13.41–14.23).

Type data.—Dr. Sailer reported that a Uhler specimen (USNM) labeled "Teffe" bears a determination of *Ectinopus rugoscutum* in what appears to be in Signoret's handwriting. It agrees with the original data and may be designated lectotype.

Specimens studied.—22 males, 25 females.

Brazil: Teffe, P. R. Uhler collection, 2 males (USNM); same locality, Raulin, Thayer Exped., 14 males, 21 females (MCZ). Santarém, May 1919, S. M. Klages, Acc. 6324, 3 males, 1 female (Car). São Paulo de Olivenca, S. Klages, January and March 1923, 1 male, 1 female (Car). Villa Brage, December 1919, 1 male (Car).

Peru: Rio Marañón, Sept. 13, 1924, F 6029, H. Bassler collection, Acc. 33591, 1 female (AmM). Iquitos, March 1920, H. S. Parsh, 1 female (USNM).

Bolivia: Ivón (Department of Beni), W. M. Mann, February, Mulford Biol. Expl. 1921–22, 1 male (USNM).

Genus *Onalips* Signoret

Onalips (in part) Signoret, 1881b, p. 323.

Signoret originally described *Onalips* for two species, *Aethus nigerrimus* Dallas (1851) and *Onalips cribratus*. Examination proves that these two are not congeneric. Therefore *Onalips* is here restricted

by designating the older of the two originally included species, *Aethus nigerrimus* Dallas (1851), as genotype.[7]

Diagnosis.—The free, foliaceous, truncated auricle with the osteole opening ventrally at its base (fig. 95) marks the species of this genus from all others in the Western Hemisphere.

Description.—Large, elongate-oval, widest posterior to mid-length; dorsum weakly convex in male, more strongly so in female, venter strongly convex.

Head: Width less than twice length; surface flattened or noticeably convex; juga as long as or longer than clypeus and contiguous beyond it; anterior outline forming a flattened semicircle, with marginal dorsal carina and complete (including clypeus) submarginal row of coarse, setigerous punctures giving rise to long and short tapering cilia (no blunt, peglike cilia except by breakage of the others); eyes large, entire, little projecting; ocelli well-developed, small, situated posterior to a line connecting hind margins of eyes, separated from eyes by more than twice an ocellar width; antennae 5-segmented, II shortest, V longest; bucculae very high, reaching almost to base of head, terminated abruptly posteriorly; labium reaching between middle coxae, II or III longest, I usually shortest, II compressed but without a foliaceous, semicircular lobe (fig. 31).

Pronotum: Length half or more of width; widest at or distinctly in front of base; sides more abruptly incurved near apical third, carinate, with submarginal row of 8 to 12 setigerous punctures; anterior margin moderately to deeply emarginate; posterior margin slightly convex; transverse impression weak to absent, median or postmedian in position; surface with few fine or several coarse punctures.

Scutellum: Triangular, width versus length variable; apex narrowed, width about half length of membranal suture; disc impunctate or with coarse, sunken punctures.

Hemelytron: Corial area well defined; exocorium and usually mesocorium with numerous distinct punctures; costa with 1 to 3 setigerous punctures; membranal suture nearly straight, lateral angle rectangular; membrane dark brown to blackish, much less than half of hemelytral length.

Propleuron: Polished, weakly to coarsely punctured; prosternal carinae low but distinct; anterior margin expanded either side of middle.

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[7] Signoret's species is African. Since it apparently fits in no described genus, it requires the erection of a new genus: *Pseudonalips*, new genus (genotype, *Onalips cribratus* Signoret, 1881b, p. 324). This new genus is easily recognized as a member of the Cydninae by the trichobothrial arrangement, and it separates from all other genera of the subfamily by the nature of the apex of the peritreme, which is undifferentiated but outlined posteriorly and laterally by the expanded and curved posterosubapical process (fig. 112).

Mesopleuron: Flattened; evaporatorium extended uninterrupted into posterolateral angle; posterior margin somewhat crenulate; mesosternum low, transversely convex, haired, partially carinate on midline.

Metapleuron: Nearly flat; osteolar peritreme (fig. 95) extending nearly half way across segment, terminating apically in a free-edged, truncated auricle with osteole opening at its base; evaporatorium occupying mesal two-thirds of segment, lateral margin oblique.

Legs: Moderately long, stout; anterior tibia (fig. 119) strongly compressed, 8 to 10 stout spines dorsally, not prolonged beyond tarsal insertion; middle and posterior tibiae subterete, latter (fig. 147) straight or slightly curved, spines equally developed dorsally and ventrally; posterior femur with row of small tubercles on posteroventral margin.

Sternites: Punctured laterally, polished medially; with or without lateral, submarginal setigerous tubercles.

Type of genus.—*Aethus nigerrimus* Dallas (1851), here designated.

Distribution.—The three species of this genus occur from Panama south to Paraguay and northern Argentina.

Key to the known species of *Onalips*

1. Scutellum and pronotal transverse impression with widely separated, coarse sunken punctures (fig. 7) . . . . **nigerrimus** (Dallas) (p. 420)
   Scutellar and pronotal discs without coarse punctures 2
2. Sixth sternite with lateral coarse punctures restricted to lateral, submarginal impressed part of abdomen (fig. 181); male with apical rim of genital capsule entire (fig. 181) . . . . **completus**, new species (p. 418)
   Sixth sternite with lateral coarse punctures extending mesad and present on lateral third or more of segment (fig. 180); male with apical rim of genital capsule convex either side of median emargination (fig. 180).
   bisinuatus, new species (p. 417)

***Onalips bisinuatus*, new species**

Plate figures 180, 203

Diagnosis.—The lack of discal punctures on both the pronotum and the scutellum plus the more extensive punctation of the sternites laterally will permit recognition of this species.

Description.—Male: From one specimen.

Head: Length more than half of width, 1.72 : 2.73; interocular width, 1.65; anterior outline a strongly flattened semicircle, fine dorsal carina distinctly submarginal apically; juga surpassing and almost contiguous beyond apex of clypeus; surface with numerous, well-separated minute punctures and a few coarser ones on each jugum.

Antennal segments: I, 0.66; II, 0.56; III, 0.68; IV, 0.93; V, 1.18. Labial segments: I, 0.96; II, 1.33; III, 1.20; IV, 1.00.

Pronotum: Length slightly more than half of width, 3.33:6.44; lateral setigerous punctures 8 to 11 in number; both lobes virtually impunctate except for a lateral, submarginal band of moderately coarse punctures.

Scutellum: Length-width ratio, 3.66:3.76; impunctate discally and apically.

Hemelytron: Shining, with abundant distinct punctures on exocorium and mesocorium; costa with one setigerous puncture.

Propleuron: With several moderately large, very shallow punctures on both convexities.

Mesopleuron and metapleuron: As described for genus.

Sternites: Shining, coarsely punctured on lateral third of V and VI; most segments without lateral submarginal setigerous tubercles.

Terminalia: Genital capsule coarsely and irregularly punctured except on mediobasal convexity; apical rim distinctly convex either side of small median emargination (fig. 180); gonostylus as illustrated (fig. 203).

Length of body: 11.46.

Female.—Three specimens. Similar to male, measurements averaging larger.

Head: Length-width ratio, 2.02(1.94–2.04):3.08(3.03–3.14); interocular width, 1.91(1.82–1.93). Antennal segments: I, 0.69(0.67–0.70); II, 0.63(0.63–0.64); III, 0.68(0.65–0.71); IV and V missing from all specimens. Labial segments: I, 1.04(0.97–1.10); II, 1.43(1.41–1.46); III, 1.46(1.46–1.46); IV, 1.04(1.04–1.04).

Pronotum: Length-width ratio, 3.96(3.82–4.16):7.16(6.92–7.39).

Scutellum: Length-width ratio, 4.32(4.20–4.42):4.42(4.12–4.57).

Length of body: 12.53(12.18–12.75).

Type data.—Holotype male (Car), labeled "Santarem, Brazil, Acc. No. 2966." Allotype female (Car), same data. Paratypes: One female (Car) labeled "Santarem, Brazil, April, 1919, S. M. Klages, Acc. 6324," and another female (Car) with the same data except month of capture reads "July."

Specimens studied: The types listed above.

Discussion.—This species and *completus* are closer to each other than they are to *nigerrimus*.

Onalips completus, new species

Plate figures 181, 204

Diagnosis.—The lack of discal punctations on both the pronotum and the scutellum plus the restricted punctation on the sternites mark this species from its congenitors.

DESCRIPTION.—MALE: Two specimens.

Head: Length more than half of width, 1.59(1.49–1.69):2.35(2.31–2.40); interocular width, 1.56(1.56–1.56); anterior outline a moderately flattened semicircle, fine dorsal carina somewhat submarginal apically; juga as long as clypeus; surface with numerous, well-separated minute punctures and no coarser ones. Antennal segments: I, 0.53(0.53-0.53); II, 0.46(0.46–0.46); III, 0.55(0.50–0.60); IV, 0.68(0.63–0.73); V, 0.88(0.86–0.90). Labial segments: I, 0.81(0.80–0.83); II, 1.07(1.05–1.10); III, 1.11(1.00–1.23); IV, 0.88(0.84–0.93).

Pronotum: Width twice or slightly more than twice length, 5.30(5.26–5.34): 2.62(2.62–2.62); lateral setigerous punctures 8 to 12 in number; both lobes virtually impunctate except for lateral submarginal band of fine punctures.

Scutellum: Length-width ratio, 3.22(3.22–3.22):3.26(3.22–3.30); impunctate discally and apically.

Hemelytron: Shining, exocorium with crowded distinct punctures; mesocorium with punctures becoming obsolete medially; costa with one setigerous puncture.

Propleuron: With no punctures or only obsolete ones out of depression.

Mesopleuron and metapleuron: As described for genus.

Sternites: Shining, with no punctures but a few moderate, longitudinal rugae mesad of sunken spiracular area; most segments usually without lateral, submarginal setigerous tubercles.

Terminalia: Male genital capsule impunctate except at extreme lateral edge, apical margin entire; gonostylus as illustrated, (fig. 204).

Length of body: 9.43(9.30–10.57).

FEMALE.—Two specimens. Similar to male, measurements larger.

Head: Length-width ratio, 1.62(1.56–1.69):2.67(2.53–2.82); interocular width, 1.72(1.62–1.82). Antennal segments: I, 0.58(0.56–0.60); II, 0.46(0.43–0.50); III, 0.56(0.50–0.63); IV, 0.76(0.70–0.83); V, 0.91(0.90–0.93). Labial segments: I, 1.00(1.00–1.00); II, 1.28 (1.20–1.36); III, 1.28(1.28–1.28); IV, 0.95(0.90–1.00).

Pronotum: Length-width ratio, 3.33(3.07–3.60):6.21(5.73–6.70).

Scutellum: Length-width ratio, 3.82(3.60–4.05):3.98(3.77–4.20).

Length of body: 11.11(10.05–12.17).

TYPE DATA.—Holotype male (USNM 64419), "Rurrenabaque, Rio Beni, Bolivia, Oct., W. M. Mann, Mulford Bio. Expl., 1921–1922." Allotype female (MCZ), "Mirim, Ceara, Brazil, Mann." Paratypes as follows:

PARAGUAY: Horqueta, Nov. 8, 1932, A. Schulze, 1 male (JCL).

BRAZIL: Chapada, September, 1 female (Car).

ARGENTINA: *Salta:* Aguaray, October 1946, Buohn, 1 female (UnivTuc). *Formosa:* "Misión Loishi," Nov. 17, 1950, Willink-Monros, 1 female (UnivTuc). *Misiones:* San Ignacio, November 1950, F. Monros, 1 female (RCF).

Discussion.—This species and *bisinuatus*, also described as new in the present paper, are much closer to each other than to *nigerrimus*.

Onalips nigerrimus (Dallas)

Plate figures 7, 31, 95, 119, 147, 205

Aethus nigerrimus Dallas, 1851, p. 112.—Walker, 1867, p. 152.—Stål, 1876, p. 25.
Onalips nigerrimus Signoret, 1881b, p. 323, pl. 10, fig. 43.—Lethierry and Severin, 1893, p. 64.

Diagnosis.—The numerous, widely separated coarse punctures on the pronotum and scutellum readily separate this species from the other two in the genus.

Description.—Male:

Head: Length more than half of width, 1.60(1.43–1.69) : 2.65(2.34–2.60); interocular width, 1.57(1.49–1.62); anterior outline a flattened semicircle; juga surpassing clypeus and contiguous beyond it, with numerous, irregularly spaced, coarse punctures, markedly tumid within submarginal row of setigerous punctures; interocellar space smooth. Antennal segments: I, 0.59(0.53–0.63); II, 0.50(0.50–0.50); III, 0.63 (0.60–0.63); IV, 0.83(0.80–0.86); V, 1.16(1.10–1.20). Labial segments: I, 0.94(0.93–1.00); II, 1.20(1.16–1.26); III, 1.20(1.13–1.33); IV, 0.83(0.83–0.86).

Pronotum: Length more than half of width, 3.05(2.85–3.30) : 5.59 (5.25–5.92); lateral setigerous punctures 7 to 11; transverse impression postmedian, with broad, irregular band of coarse, sunken punctures; anterior lobe punctured behind anterior emargination and laterally.

Scutellum: Length and width subequal or one longer than the other, length-width ratio, 3.30(3.00–3.75):3.26(3.00–3.45); surface polished with numerous coarse, sunken punctures discally, these becoming finer apically.

Hemelytron: Usually distinctly duller than scutellum; abundantly punctured on exocorium and mesocorium; costa with 2 to 4 setigerous punctures.

Propleuron: With numerous coarse punctures on both convexities.

Mesopleuron and metapleuron: As described for genus.

Sternites: Polished, with numerous coarse punctures on lateral third; some or all with one to three setigerous tubercles on lateral submargin.

Terminalia: Genital capsule shining, punctured laterally and at base, apical margin sinuate medially; gonostylus as illustrated (fig. 205).

Length of body: 10.16(9.21–10.95).

Female.—Very similar to male, measurements averaging larger.

Head: Length-width ratio, 1.77(1.69–1.90) : 2.61(2.50–2.73); interocular width, 1.71(1.69–1.75). Antennal segments: I, 0.64(0.63–

0.66); II, 0.51(0.50–0.56); III, 0.59(0.53–0.63); IV, 0.81(0.76–0.90); V, 1.10(1.00–1.20). Labial segments: I, 0.95(0.86–1.00); II, 1.23 (1.16–1.30); III, 1.32(1.26–1.40); IV, 0.84(0.83–0.90).

Pronotum: Width-length ratio, 6.00(5.77–6.45):3.25(2.85–3.60).

Scutellum: Length-width ratio, 3.59(3.45–3.75):3.51(3.30–3.75).

Length of body: 10.95(10.20–11.70).

Type data.—The type specimen (BrM) was listed by Dallas as from Colombia.

Specimens studied.—10 males, 6 females.

Panama: Campana, Apr. 27, 1937, R. Bliss, 1 female (JCL). *Canal Zone:* Ancón, Aug. 6, 1924, W. M. Wheeler, *Cordia alliadora,* 1 male (MCZ). Barro Colorado Island, May 1, 1926, Van Tyne, 1 male (MCZ). No specific locality, January–March 1944, Zetek, May 22, 1 male (USNM); January, Griswold, 1 male (MCZ); July–August 1942, J. Zetek, 1 female (USNM); June 24, 1924, N. Banks, 1 female (MCZ).

Colombia: Monteria, 6 males, 3 females.

Discussion.—A male specimen (MCZ) bears the notation that it had been collected on "*Cordia alliadora.*"

Genus *Melanaethus* Uhler, new status

Geotomus of authors, not Mulsant and Rey, 1862, p. 324.
Melanaethus Uhler, 1876, p. 280.
Lobonotus Uhler, 1877, p. 395, (nec Milne-Edwards, 1863, p. 280, in Crustacea). New synonymy.
Lobolophus Bergroth, 1891, p. 235. New synonymy.

Diagnosis.—Among those genera in which the terminal lobe of the peritreme is developed into a short process, the members of this genus may be recognized by the small size (3–6 mm.) and the more extensively developed metapleural evaporatorium (figs. 96, 97).

Description.—Small to moderately large, oval to elongate, greatest width across humeri or across hemelytra posterior to midlength; dorsum much less convex than venter.

Head: As wide as or wider than long, flattened or slightly convex above; juga as long as clypeus, variously curved, usually with fine marginal carina dorsally; submargin with one setigerous puncture, except in *planifrons,* which has three or four; eyes projecting by one-fourth to three-fourths their width; ocelli present, on or behind line connecting posterior margins of eyes; antennae 5-segmented, I shortest, V usually longest, II, III, and IV varying in proportions; bucculae moderately to strongly elevated, highest posteriorly, posterior end usually abruptly terminated (fig. 23); labium variable in length according to species, reaching from middle of mesosternum to basal segments of abdomen, II longest, slightly compressed, without foliaceous lobe.

Pronotum: Length usually not more than half of width; lateral margins converging on anterior half or more, with not more than six setigerous punctures submarginally; transverse impression absent to well-developed and complete; posterior margin broadly and slightly curved or subtruncated; angles more or less rounded.

Scutellum: Distinctly longer than broad, triangular, apex narrowed and less than half of membranal suture.

Hemelytron: Corial areas well-defined; membranal suture straight, convex or sinuate, not prolonged laterally; costa usually sharp, explanate and with no or very few setigerous punctures; membrane not over two-fifths of hemelytral length, sometimes brachypterous.

Propleuron: Moderately convex; convexities and depression rugose and/or punctate or smooth and impunctate; prosternal carinae prominent.

Mesopleuron (fig. 96): Flattened, evaporatorium occupying half or more of segment, lateral margin strongly oblique, reaching near or into posterolateral angle; posterior margin entire; mesosternum with prominent, distinct, median carina on basal half or more of nearly all species.

Metapleuron (figs. 96, 97): Flattened to uneven; evaporatorium occupying mesal two-thirds or three-fourths, lateral margin convex or straight and oblique; peritreme reaching or surpassing middle of segment, apical modification expanded posteriorly as semicircular, quadrate or triangular, more or less shining lobe, osteole usually opening posteriorly on peritreme.

Legs: Moderately long, slender; anterior tibia (fig. 120) moderately compressed, with four to seven long, slender to stout spines on dorsal margin; middle and posterior tibiae terete, spines of latter (fig. 144) subequally developed on all margins; tarsal II shortest, I shorter than III.

Sternites: Strongly convex, shining or alutaceous, with or without setigerous punctures or rugae; posterior margin of each segment more or less finely and acutely crenulate.

Type of genus.—*Melanaethus elongatus* Uhler (1876), monobasic. When Signoret (1883) transferred *elongatus* Uhler and *Cydnus elongatus* Herrick-Schaeffer to *Geotomus*, Uhler's name became a homonym for which Signoret proposed the new name *parvulus*. *Lobonotus* Uhler was described for the lone species *anthracinus* Uhler (1877); because Uhler's use of this name was preoccupied by Milne-Edwards (1863, p. 280) in Crustacea, Bergroth (1891) proposed *Lobolophus* to replace it. *Lobolophus* must take *anthracinus* Uhler for type by objective synonymy.

Distribution.—*Melanaethus* is restricted to the Western Hemisphere where its members occur in the area from Maryland to California in the north and to southern Brazil in the south.

Discussion.—Most members of this genus have long gone under the name *Geotomus*, but the few recently described species have been assigned to *Geocnethus* of Horváth. Most authors have considered *Melanaethus* to be a synonym of Mulsant and Rey's *Geotomus*, for which *Cydnus punctulatus* Costa (1847, p. 30) was designated as type by Distant (1902, p. 98). From the present study and a partially completed attempt to redefine the cydnid genera of the world, this position appears untenable. The New World species assigned here are not congeneric with *Geotomus punctulatus* and can readily be separated from it by several features, as follows: (1) Terminal process of osteolar peritreme of *G. punctulatus* is auriculate in shape with the osteole opening near the center of its base (fig. 98), while this structure on American species of *Melanaethus* is variously convex posteriorly with osteole opening posteriorly on the peritreme at the base of the expansion (figs. 96, 97). (2) *G. punctulatus* has nine or ten submarginal setigerous punctures laterally on the pronotum, three or more of them posterior to the transverse impression, while no species of *Melanaethus* possesses more than six such punctures, only one of which is posterior to the transverse impression. (3) The head of *G. punctulatus* has a submarginal row of five to seven setigerous punctures bearing long, coarse hairs, while in the forms here assigned to *Melanaethus* all but the new species *planifrons* has but one such puncture. Of these characters, the shape of the terminal process of the osteolar peritreme appears to be most important.

Horváth's genus *Geocnethus*, to which several American species have been accredited, also has an Old World genotype, *obesus* Horváth (1919, p. 248), by original designation. Examination of the type of *Geocnethus obesus* shows that it lacks a terminal modification of the peritreme and so surely cannot include among its closest relatives species which have a terminal modification.

The 16 species here treated as members of *Melanaethus* can be arranged into rather distinct groups based on the extent of the osteolar peritreme, as indicated by the first couplet of the key to species. One group, centering around *M. cavicollis* (Blatchley), agrees with the subgenus *Rhytidoporus* (*Rhytidoporus*) in appearing to be restricted to the region of the Caribbean islands with an invasion of the surrounding mainland at two points. The remainder of the species of *Melanaethus* are continental forms, with only two species occurring south of middle Central America.

Key to the known species of *Melanaethus*

1. Terminal lobe of peritreme triangular posteriorly, separated from lateral margin of evaporatorium by much more than transverse diameter of the lobe (fig. 97) 2
   Terminal lobe of peritreme semicircular or subquadrate posteriorly, separated from lateral margin of evaporatorim by less than transverse diameter of the lobe (fig. 96) 5
2. Anterior convexity of propleuron with numerous coarse punctures. **cavicollis** (Blatchley) (p. 428)
   Anterior convexity of propleuron impunctate 3
3. Dorsum of head and sides of anterior pronotal lobe impunctate. **cubensis** (Barber and Bruner) (p. 432)
   Dorsum of head and sides of anterior pronotal lobe with several to many coarse punctures 4
4. Posterior pronotal lobe and scutellar disc with many crowded, coarse, foveate punctures . . . . **aereus,** new species (p. 425)
   Posterior pronotal lobe and scutellar disc with many small, widely separated punctures . . . . **externus,** new species (p. 433)
5. Dorsum of head with a fine marginal carina extending from eye to apex . . 7
   Dorsum of head without a fine marginal carina or with a partial one immediately anteiior to eye 6
6. Pronotum with transverse impression and intercallar area distinctly but obtusely impressed; labium surpassing base of sternite III. **anthracinus** (Uhler) (p. 426)
   Pronotum convex, transverse impression and intercallar area not depressed; labium not surpassing middle coxae . . . . **spinolae** (Signoret) (p. 449)
7. Costal edge thick, calloused, strongly but narrowly convex dorsally; jugum with three coarse (rarely more), widely separated setigerous punctures submarginally . . . . **planifrons,** new species (p. 443)
   Costa flat, thin, neither calloused nor convex dorsally; jugum with not more than one setigerous puncture submarginally 8
8. Head dorsally impunctate or with few patches of minute punctures. **pensylvanicus** (Signoret) (p. 441)
   Head dorsally distinctly punctate or rugopunctate over most of surface . . 9
9. Pronotal disc, especially transverse impression, with numerous punctures of which many are as coarse as those on sides; scutellum usually distinctly punctured to base 11
   Pronotal disc, especially transverse impression and posterior lobe, polished, with few minute punctures much finer than those on sides; scutellar punctation becoming obsolete basally 10
10. Costa straight and subparallel on basal half, neither explanate nor recurved near base . . . . **uhleri** (Signoret) (p. 453)
    Costa gently convex, diverging on basal half, explanate and gently recurved near base . . . . **subpunctatus** (Blatchley) (p. 451)
11. Pronotum with punctures of transverse impression and posterior lobe (and usually also one-half of scutellum) of two sizes, coarse and fine ones intermixed 12
    Pronotum with punctures of transverse impression and posterior lobe of one size or those of latter becoming finer posteriorly, often with fine longitudinal rugae between the punctures 15

12. Pronotum with broad, shallow, punctate impression extending anteriorly between calli from middle of weak transverse impression (fig. 67).
noctivagus (Van Duzee) (p. 436)
Pronotum not impressed between calli 13
13. Length of body about twice pronotal width.
punctatissimus (Signoret) (p. 445)
Length of body distinctly less than twice (77:42) pronotal width 14
14. Apical two-thirds of mesocorial disc with numerous coarse punctures subequal to those of two rows paralleling claval suture; larger, length of body, 3.6–4.2 . . . . **robustus** Uhler (p. 447)
Apical two-thirds of mesocorial disc with scattered punctures finer than those of two rows paralleling claval suture; smaller, length of body, 3.0–3.3.
mixtus, new species (p. 434)
15. Pronotum with transverse impression distinctly impressed across full width; corium polished . . . . **subglaber** (Walker) (p. 437)
Pronotum with transverse impression obsolete, absent medially; corium distinctly alutaceous . . . . **crenatus** (Signoret) (p. 430)

***Melanaethus aereus*, new species**

Plate figure 206

Diagnosis.—The small, terminal lobe of the peritreme coupled with the very coarse, sunken, close-set punctures on the posterior lobe of the pronotum and scutellum will permit recognition of *aereus* within the genus.

Description.—From a single male. Oval, widest behind mid-length.

Head: Length more than two-thirds width, 0.92:1.33; interocular width, 0.73; anterior outline a very shallow semicircle, clypeus as long as juga, narrowed apically; surface shining, with radiating rows of few, coarse punctures; margin thick, submarginal dorsal carina distinct only on anterior third or half of jugum; ocelli moderately large, separated from eye by space greater than transverse ocellar width; jugum ventrally and maxillary plate (except posteriorly) impunctate. Antennal segments: I, 0.29; II, 0.44; III, 0.39; IV, 0.46; V, 0.60. Bucculae about as high as labial II, posterior end curved; labium reaching between middle coxae. Labial segments: I, 0.49; II, 0.81; III, 0.94; IV, 0.43.

Pronotum: Length about half of width, 1.56:3.10; anterior margin deeply, simply emarginate; lateral margin broadly, shallowly sinuate medially, submarginal row of five setigerous punctures; transverse impression absent, marking row of punctures very coarse, sunken, confused with numerous close-set punctures of posterior lobe; anterior lobe with numerous coarse, close-set punctures laterally, middle half strongly depressed for full length.

Scutellum: Length greater than width, 2.29:1.77; disc shining, with numerous coarse, close, sunken punctures becoming finer at apex.

Hemelytron: Clavus and corium strongly alutaceous; clavus with one long and one short row of punctures; mesocorium with numerous

coarse punctures in basal third, these continued as two complete rows paralleling claval suture and with a few finer ones scattered over mesal half; exocorium with numerous finer punctures scattered irregularly for full length; costa convex, with one setigerous puncture; membranal suture feebly sinuate, lateral angle slightly produced; membrane longer than basal width, reaching apex of abdomen.

Propleuron: Shining, punctate only in depression and near acetabulum; prosternal carinae about half as high as labial II, abruptly terminated ventrally.

Mesopleuron: Lateral area impunctate.

Metapleuron: Peritreme terminated by small, triangular lobe which is separated from gently concave lateral margin of evaporatorium by space greater than width of terminal lobe (similar to fig. 97); lateral area impunctate.

Legs: Anterior tibia with five stout spines dorsally.

Sternites: Shining, with few coarse punctures on lateral third near posterior margin of each segment.

Terminalia: Apical margin entire, straight; gonostylus as illustrated (fig. 206).

Length of body: 6.05.

Type data.—Holotype male (MCZ), "Whitfield Hall, Blue Mts., Hayti, near 4500 ft., Aug. 13–20, 1934, Darlington."

Discussion.—The trivial name is in allusion to the bronzed cast that is visible on this species.

Melanaethus anthracinus (Uhler), new combination

Plate figure 207

Lobonotus anthracinus Uhler, 1877, p. 395; 1886, p. 3.—Distant, 1880, p. 9, pl. 4, fig. 7.—Signoret, 1883, p. 529, pl. 16, fig. 208.—Bergroth, 1891, p. 235.—Lethierry and Severin, 1893, p. 77.—Banks, 1910, p. 100.

Lobolophus anthracinus Van Duzee, 1917, p. 24.—Torre Bueno, 1939, p. 184.

Description.—Based on one male and one female.

Male: Elongate, sides parallel.

Head: Length about four-fifths width, 0.82:0.96; interocular width, 0.66; anterior outline elongate, acute, clypeus slightly longer than juga, slightly narrowed apically; surface strongly convex transversely; juga, interocellar area and clypeus with numerous fine, close-set punctures, without or with obsolete, submarginal dorsal carinae, ocelli moderate, separated from eye by space less than twice transverse ocellar width; jugum ventrally shining, impunctate; maxillary plate with few large punctures. Antennal segments: I, 0.23; II, 0.30; III, 0.32; IV, 0.45; V, missing; bucculae higher than labial II, roundingly terminated posteriorly. Labium attaining sternite IV. Labial segments: I, 0.23; II, 0.91; III, 0.86; IV, 0.66.

Pronotum: Length half of width, 1.04:2.08; anterior margin deeply, almost quadrately emarginate; lateral margin subparallel on basal third, with one submarginal setigerous puncture at apical angle; transverse impression postmedian, moderately impressed across full length, medially extended anteriorly as distinct impression between convex calli; anterior lobe with dense, moderate punctures laterally, anteriorly and medially, calli polished, with minute punctures centrally; posterior lobe densely punctate almost to hind margin.

Scutellum: Length greater than width, 1.57:1.30; surface shining, all except basal angles with crowded, small to moderate punctures, apical half with faint suggestion of median carina.

Hemelytron: Clavus and corium polished; clavus with two rows of punctures; mesocorium with two complete rows of punctures paralleling claval suture, elsewhere with abundant, distinct punctures; exocorium with more abundant punctation; costa very narrowly convex dorsally, without setigerous punctures; membranal suture almost straight, lateral angle not prolonged; membrane slightly longer than basal width, just surpassing apex of abdomen.

Propleuron: Alutaceous, strongly punctate in depression and anteriorly to acetabulum, with few fine punctures on anterior convexity.

Mesopleuron: Evaporatorium extended into posterolateral angle, not reaching lateral margin of sclerite; lateral area in part rugopunctate.

Metapleuron: Peritreme reaching almost to straight lateral margin of pronotum, terminal modification large, semicircular, distinctly alutaceous, more shining than evaporatorium; lateral area shining, with few striae. Legs: Anterior tibia with five stout spines dorsally.

Sternites: Polished, finely punctate medially, very coarsely so laterally.

Terminalia: Genital capsule punctate, more densely so laterally, apical margin virtually straight; gonostylus as illustrated (fig. 207).

Length of body: 4.50.

Female.—Very similar to male.

Head: Length-width ratio, 0.86:1.07; interocular width, 0.73. Antennal segments: I, 0.23; II, 0.33; III, 0.34; IV, 0.48; V, 0.36. Labial segments: I, 0.46; II, 1.06; III and IV missing.

Pronotum: Length-width ratio, 1.10:2.28.

Scutellum: Length-width ratio, 1.76:1.34.

Length of body: 4.97.

Type data.—The two females in the Uhler collection (USNM) from which this species was originally described were collected in McLennan Co., Tex.

Specimens studied.—2 males, 1 female.

United States: *New Mexico:* No exact locality, Uhler collection, 1 female (USNM). *Texas:* Colorado City, July 17, 1927, L. A. Stephenson, 1 male (KU). Mexico: *Distrito Federal:* No exact locality, July 10, 1 male (Bon).

Discussion.—The greatly elongate labium reaching onto basal sternites occurs in two other areas in the family as found in the Western Hemisphere. In the Cydninae it appears on *Dallasiellus longulus* (Dallas), while in the Amnestinae it may be found on one species of *Amnestus*.

Melanaethus cavicollis (Blatchley), new combination

Plate figures 97, 208

Geotomus cavicollis Blatchley, 1924, p. 85.
Geocnethus cavicollis Hussey, 1925, p. 63.—Torre Bueno, 1939, p. 182.

Diagnosis.—Within the genus, *cavicollis* may be recognized by the reduced size of the apical modification of the peritreme and the number of coarse punctures present on most of anterior convexity of propleuron.

Description.—Male: Elongate-oval, widest posterior to mid-length.

Head: Length more than half width, 0.77(0.72–0.83):1.28(1.23–1.37); interocular width, 0.80(0.74–0.84); anterior outline a flattened semicircle, clypeus as long as juga, narrowed apically; surface weakly convex, numerous distinct punctures arranged in radiating rows, submarginal dorsal carina distinct only on apical half or less; ocelli moderate, separated from eyes by space more than twice transverse ocellar width; jugum ventrally polished, impunctate; maxillary plate coarsely punctate except at base of antenna. Antennal segments: I, 0.27(0.26–0.30); II, 0.36(0.32–0.40); III, 0.38(0.36–0.42); IV, 0.43(0.40–0.47); V, 0.58(0.56–0.60). Bucculae higher than labial II, abruptly sloping posteriorly; labium extending between middle coxae. Labial segments: I, 0.44(0.43–0.46); II, 0.75(0.73–0.82); III, 0.55(0.53–0.60); IV, 0.40(0.40–0.42).

Pronotum: Length more than half of width, 1.45(1.36–1.55):2.75 (2.52–3.04); anterior margin moderately, simply concave; lateral margin straight to very weakly concave on middle third, with submarginal row of four or five setigerous punctures; transverse impression almost absent, site marked by irregular row of coarse, widely separated punctures; anterior lobe with coarse punctures clustered behind each eye and in broad lateral band, middle half strongly impressed for full length; posterior lobe coarsely, closely punctate laterally and sparsely so medially.

Scutellum: Length greater than width, 1.97(1.86–2.15):1.68(1.62–1.81); disc shining, with scattered, coarse punctures on apical three-fourths.

Hemelytron: Clavus and corium weakly alutaceous; claval punctures arranged in one complete row and sometimes partial second row basally; mesocorium distinctly punctate except at middle, mesal punctures arranged in two complete rows; exocorium distinctly punctate for full length; costa convex, with two setigerous punctures; membranal suture straight, lateral angle not prolonged: membrane longer than basal width, reaching apex of abdomen.

Propleuron: Strongly punctate on anterior convexity and in depression; prosternal carinae less than half as high as labial II, abruptly terminated posteriorly.

Mesopleuron: Lateral area with not more than one or two distinct punctures.

Metapleuron (fig. 97): terminal process of peritreme triangular posteriorly, separated from straight edge of evaporatorium by space much greater than transverse width of terminal modification.

Legs: Anterior tibia with five stout spines dorsally.

Sternites: Shining, obsoletely alutaceous, with numerous distinct punctures on lateral fourth of each, elsewhere minutely punctate.

Terminalia: Genital capsule shining, impunctate, apical margin slightly convex either side of middle; gonostylus as illustrated (fig. 208).

Length of body: 5.42(5.05–5.97).

Female.—Similar to male but lacking prominent impression in middle of anterior pronotal lobe.

Head: Length-width ratio, 0.87(0.85–0.91):1.27(1.20–1.36; interocular width, 0.73(0.70–0.76). Antennal segments: I, 0.27(0.26–0.30); II, 0.35(0.32–0.42); III, 0.36(0.33–0.40); IV, 0.42(0.40–0.45); V, 0.56(0.52–0.60). Labial segments: I, 0.42(0.41–0.46); II, 0.75 (0.73–0.82); III, 0.53(0.48–0.56); IV, 0.41(0.40–0.43).

Pronotum: Length-width ratio, 1.44(1.31–1.62):2.68(2.45–2.95).

Scutellum: Length-width ratio, 1.93(1.75–2.12):1.62(1.49–1.75).

Length of body: 5.34(4.95–5,83).

Type data.—The types, taken from Arch Creek and Dunedin, Fla., are in the Blatchley collection (Pur).

Specimens studied.—8 males, 7 females.

United States: *Florida:* Gainesville, Oct. 13, 1923, T. H. Hubbell, 1 male, 2 females (RFH); W. E. Penner, 1 male (USNM); February 1930, W. S. Blatchley (BrM). Edgewater, Mar. 6, 1939, C. A. Frost, 2 males, 1 female (USNM). "Miaku," Feb. 3, 1911, W. S. Blatchley, 1 female (CalAc). Mewman's Lake, Mar. 15, 1926, T. H. Hubbell, 1 male, (KU). Winter Park, Mar. 1, 1939, F. E. Lutz, 1 female (AmM). *South Carolina:* Florence, Feb. 1, 1939, C. F. Rainwater, 3 males, 2 females (USNM, RCF).

Discussion.—Both Blatchley and Hussey, in the citations listed above, reported taking this species from the ground under leaves or other debris. Specimens examined bore the notations "in woods trash" and "Berlese funnel material, in dry magnolia-hickory hummock."

The four species that run through the first half of the first couplet of the key to species form a closely knit unit that probably deserves taxonomic recognition of some sort, perhaps as a subgenus. This group would be characterized by the small, triangular terminal process of the osteolar peritreme which is separated from the lateral edge of the evaporatorium by a space greater than the transverse width of the process, and by the thick, calloused margins of the head, with the incomplete, submarginal, dorsal carina. Since three of the four species which would be included in such a group are represented by only one specimen in the material studied, the author hesitates to make such a division at this time.

Melanaethus crenatus (Signoret), revived combination

Plate figure 209

Geotomus (Melanaethus) crenatus Signoret, 1883, p. 208, pl. 4, fig. 171.
Melanaethus crenatus Uhler, 1886, p. 3.
Geotomus crenatus Lethierry and Severin, 1893, p. 72.

Diagnosis.—Among those species of the genus with the large terminal lobe on the peritreme this one may be recognized by the distinctly alutaceous coria.

Description.—Male: Elongate-oval, sides subparallel.

Head: Length about two-thirds of width, 0.56(0.54–0.60):0.81 (0.80–0.82); interocular width, 0.56(0.55–0.60); anterior outline a more or less truncated semicircle, clypeus as long as juga, narrowed apically; dorsum densely and in part confluently punctate; with distinct marginal carina dorsally; ocelli very small, separated from eye by space more than three times transverse ocellar width; jugum ventrally shining; maxillary plate punctate. Antennal segments: I, 0.16(0.15–0.19); II, 0.16(0.16–0.18); III, 0.19(0.17–0.20); IV, 0.25(0.23–0.26); V, 0.33(0.33–0.35). Bucculae higher than labial II, abruptly terminated posteriorly; labium attaining bases of middle coxae. Labial segments: I, 0.22(0.20–0.23); II, 0.44(0.37–0.50); III, 0.30(0.27–0.33); IV, 0.25(0.22–0.26).

Pronotum: Length more than half width, 0.67(0.64–0.70) : 0.91 (0.86–0.93); anterior margin moderately, singly emarginate; lateral margin nearly straight and subparallel on basal half, without setigerous punctures submarginally; transverse impression weak to obsolete, postmedian, without a special line of coarser punctures marking it; anterior lobe with numerous prominent punctures laterally, subapically and medially, calli polished, with several scattered, finer

punctures; posterior lobe with numerous prominent, elongate punctures over entire surface, sometimes with short, longitudinal rugulae between.

Scutellum: Longer than wide, 1.19(1.13–1.23):0.96(0.93–1.01); surface sculpture similar to but less dense than that of posterior pronotal lobe.

Hemelytron: Clavus and corium alutaceous; clavus with one or two partial rows in addition to one complete row of punctures; mesocorium with two complete rows of punctures paralleling claval suture, elsewhere with well-separated punctures becoming much finer apically; punctation of exocorium similar to but more dense than that of mesocorium; costa without setigerous punctures; membranal suture straight, lateral angle not produced; membrane longer than basal width, usually just reaching apex of abdomen.

Propleuron: Shining, with numerous irregular, anastomosing, longitudinal rugae; prosternal carinae almost as high as labial II, abruptly terminated posteriorly.

Mesopleuron: Evaporatorium extended into posterolateral angle, not reaching lateral margin of segment; lateral area in part rugopunctate.

Metapleuron: Terminal lobe of peritreme semicircular, reaching almost to convex lateral margin of evaporatorium; lateral area in part rugopunctate.

Legs: Anterior tibia with five or six stout spines dorsally.

Sternites: Shining and minutely punctate on middle half, coarsely rugopunctate on lateral fourth.

Terminalia: Genital capsule shining, distinctly punctate in lateral angles, apical margin straight; gonostylus as illustrated (fig. 209).

Length of body: 3.32(3.18–3.42).

Female: Similar to males, measurements averaging larger. Head: Length-width ratio, 0.60(0.56–0.64):0.83(0.80–0.91); interocular width, 0.59(0.56–0.63). Antennal segments: I, 0.17(0.16–0.20); II, 0.18(0.15–0.20); III, 0.19(0.14–0.24); IV, 0.25(0.25–0.26); V, 0.34(0.33–0.37). Labial segments: I, 0.22(0.19–0.26); II, 0.42(0.36–0.51); III, 0.31(0.26–0.36); IV, 0.26(0.24–0.33).

Pronotum: Length-width ratio, 0.94(0.90–1.03):1.73(1.62–1.87).

Scutellum: Length-width ratio, 1.26(1.13–1.34):1.04(0.90–1.16).

Length of body: 3.43(3.25–3.60).

Type data.—Signoret described this species from "Mexique." The type is probably in the Naturhistorisches Museum, Vienna.

Specimens studied.—33 males, 32 females.

United States: *Arizona:* Castle Hot Springs, Gila Co., Miller Canyon (Huachuca Mts.), Nogales, Sabino Canyon (Santa Catalina Mts.); April, August,

November. *Texas:* Laredo (on orchid from Mexico), San Antonio, Sheffield; March, April, June.

MEXICO: *Distrito Federal:* Pedregal de San Angel, August. *México:* Tejupilco.

DISCUSSION.—The Laredo, Tex., specimen listed above was taken from an orchid which had been imported from Guerrero, Mexico. One other specimen was labeled "Taken at light."

Melanaethus cubensis (Barber and Bruner), new combination

Geocnethus cubensis Barber and Bruner, 1932, p. 236.

DIAGNOSIS.—The combination of the small terminal lobe of the peritreme and the lack of punctures on the head and anterior pronotal lobe will permit ready recognition of this species among the other members of the genus.

DESCRIPTION.—FEMALE: Based on paratype (USNM). Elongate-oval, sides nearly parallel.

Head: Length about two-thirds width, 0.83:1.21; interocular width, 0.70; anterior outline almost semicircular, clypeus as long as juga, narrowing towards apex; margin of head thick, calloused, dorsal "carina" distinctly submarginal; surface somewhat flattened, little depressed submarginally, mostly obsoletely alutaceous, virtually impunctate; ocelli large, separated from eye by space greater than transverse ocellar width; jugum ventrally polished, impunctate; maxillary plate punctate ventrally and posteriorly. Antennal segments: I, 0.26; II, 0.38; III, 0.38; IV, 0.43; V, 0.62. Bucculae not as high as labial II; labium reaching between middle coxae. Labial segments: I, 0.40; II, 0.80; III, 0.56; IV, 0.43.

Pronotum: Length more than half of width, 1.43:2.69; anterior margin shallowly emarginate; lateral margin weakly sinuate at anterior third, with submarginal row of four or five setigerous punctures; transverse impression virtually absent, indicated laterally by few small punctures; both lobes obsoletely alutaceous, minutely punctate; anterior lobe without large punctures, with obsolete, subapical impression; posterior lobe with not more than five small punctures.

Scutellum: Longer than wide, 2.02:1.62; surface obsoletely alutaceous, minutely punctured, with few coarse punctures scattered over disc.

Hemelytron: Clavus and corium distinctly alutaceous; clavus with one row of punctures; corium with one complete row of punctures and basal part of second row paralleling claval suture; costa convex, with two setigerous punctures; membranal suture weakly sinuate, lateral angle not prolonged; membrane longer than basal width, surpassing apex of abdomen.

Propleuron: Both convexities impunctate; prosternal carinae less than half as high as labial II.

Mesopleuron: Lateral area impunctate.

Metapleuron: Terminal lobe of peritreme triangular posteriorly, removed from straight lateral margin of evaporatorium by space greater than width of terminal lobe (somewhat similar to fig. 97); lateral area impunctate.

Legs: Anterior tibia with five dorsal spines; posterior tibia weakly sinuate subapically.

Sternites: Alutaceous, with several coarse, shallow punctures in spiracular area.

Length of body: 5.36.

TYPE DATA.—Type male (USNM) is from Cayamas, Cuba.

SPECIMENS STUDIED:

CUBA: Cayamas, April 3, E. A. Schwarz, 1 male (holotype, USNM); Sierra Rangel, Aug. 28, 1929, J. Acuna and S. C. Bruner, 1 female (USNM).

***Melanaethus externus*, new species**

DIAGNOSIS.—Within the genus *Melanaethus* this species may be recognized by the reduced, triangular terminal process of the peritreme, the presence of numerous, coarse punctures on head and side of anterior pronotal lobe, and the lack of punctures on the anterior convexity of the propleuron.

DESCRIPTION.—Based on one female. Elongate-oval, widest posterior to midlength.

Head: Length about two-thirds width, 0.80:1.12; interocular width, 0.66; anterior outline a full semicircle, clypeus as long as juga, narrowed apically; surface slightly convex, juga with numerous crowded punctures, margin thick, with partial, submarginal dorsal carina; ocelli small, separated from eye by space more than three times transverse ocellar width; jugum ventrally and maxillary plate (except posteriorly) shining, impunctate. Antennal segments: I, 0.26; II, 0.33; III, 0.34; IV, 0.41; V, missing. Bucculae about as high as labial II, abruptly terminated posteriorly; labium reaching bases of middle coxae. Labial segments: I, 0.40; II, 0.77; III, 0.49; IV, 0.40.

Pronotum: Length about half of width, 1.26:2.40; anterior margin deeply, doubly emarginate; lateral margin straight to faintly concave on middle third, with submarginal row of five setigerous punctures; transverse impression weak, postmedian, marked by irregular double row of distinct punctures; anterior lobe with single row of distinct punctures paralleling anterior emargination between eyes, and with broad patch of them laterally; posterior lobe with few punctures scattered medially and laterally.

Scutellum: Longer than wide, 1.82:1.43; surface shining, with irregularly scattered, strong punctures over surface except at base and apex.

Hemelytron: Clavus and corium alutaceous; clavus punctate near base and with single longitudinal row; mesocorium with one complete row of punctures paralleling claval suture and with punctures crowded on basal third; exocorium with few punctures scattered along length; costa convex, with one setigerous puncture; membranal suture nearly straight; membrane longer than basal width, reaching apex of abdomen.

Propleuron: Shining, distinctly punctate only in depression and at base of acetabulum; prosternal carinae about half as high as labial II, abruptly terminated posteriorly.

Mesopleuron: Lateral area rugose, impunctate.

Metapleuron: Terminal lobe of peritreme triangular posteriorly, separated from straight lateral margin of evaporatorium by space greater than transverse width of lobe; lateral area impunctate.

Legs: Anterior tibia with six stout spines dorsally.

Sternites: Finely alutaceous, with very few punctures behind spiracular area.

Length of body: 4.71.

Type data.—Holotype female (USNM 64416), from Veracruz, Mexico, "F. H. B., 586."

Discussion.—See discussion under *M. cavicollis* (Blatchley).

Melanaethus mixtus, new species

Plate figure 211

Diagnosis.—The small size, presence of two types of punctures on posterior lobe of the pronotum, lack of an impression between the calli, and the large terminal lobe on the peritreme will permit separation of this species from others in the genus.

Description.—Male: Two specimens, one lacking antennae and labium. Oval, robust, sides subparallel or weakly diverging posteriorly.

Head: Length almost two-thirds width, 0.47(0.47–0.47):0.76(0.76–0.76); interocular width, 0.52(0.51–0.53); anterior outline broad, less than a semicircle, clypeus as long as or very slightly longer than juga; surface, including clypeus, shining, with crowded, distinct punctures; jugum with distinct, marginal carina dorsally, one submarginal setigerous puncture; ocelli small, separated from eye by space more than twice transverse ocellar width; jugum ventrally shining, impunctate; maxillary plate distinctly punctate on basal two-thirds. Antennal segments (missing from larger specimen): I, 0.16; II, 0.16; III, 0.16; IV, 0.23; V, 0.27. Bucculae higher than labial II, abruptly terminated posteriorly; labium reaching between middle coxae. Labial segments (missing from larger specimen): I, 0.21; II, 0.40; III, 0.27; IV, 0.23.

Pronotum: Length slightly more than half of width, 0.87(0.84–0.90):1.60(1.56–164); anterior margin moderately, simply emarginate; lateral margin straight on basal half, without submarginal row of setigerous punctures; transverse impression obsolete, postmedian, without defining row of special punctures; anterior lobe with numerous crowded punctures laterally, subapically and between calli, latter with minute punctures discally; posterior lobe with fine punctures over entire width, these mixed with coarser ones anteriorly.

Scutellum: Longer than wide, 1.16(1.15–1.17):0.94(0.93–0.95); shining; surface, except basal angles, with scattered fine and coarse punctures.

Hemelytron: Clavus and corium polished or weakly alutaceous; clavus with 1½ rows of punctures; mesocorium with two rows of punctures paralleling claval suture, elsewhere punctures becoming much finer and more widely scattered towards apex; exocorium punctate similar to mesocorium; costa flattened, slightly reflexed, without setigerous punctures; membranal suture straight, lateral angle not prolonged; membrane longer than basal width, reaching apex of abdomen.

Propleuron: Anterior convexity with numerous crowded, longitudinal rugulae, depression with coarser punctures; prosternal carinae less than half as high as labial II, abruptly terminated posteriorly.

Mesopleuron: Evaporatorium reaching into posterolateral angle but not to side of margin of segment; lateral area in part coarsely rugopunctate.

Metapleuron: Peritreme terminated by large, semicircular lobe reaching almost to lateral margin of evaporatorium; lateral area with few distinct striae.

Legs: Anterior tibia with five stout spines dorsally.

Sternites: Weakly alutaceous and minutely punctate, with few distinct punctures and weak rugae laterally near spiracular area.

Terminalia: Genital capsule with few more punctures laterally, apical margin entire, weakly convex; gonostylus as illustrated (fig. 211).

Length of body: 3.17(3.09–3.29).

Female: Similar to male.

Head: Length-width ratio, 0.52(0.50–0.56):0.79(0.78–0.83); interocular width, 0.54(0.53–0.56). Antennal segments: I, 0.16(0.16–0.19); II, 0.17(0.16–0.20); III, 0.18(0.16–0.23); IV, 0.24(0.21–0.27); V, 0.30 (0.27–0.33). Labial segments: I, 0.20(0.20–0.22); II, 0.38(0.33–0.41); III, 0.31(0.30–0.33); IV, 0.24(0.22–0.30).

Pronotum: Length-width ratio, 0.92(0.88–0.95):1.67(1.58–1.76).

Scutellum: Length-width ratio, 1.23(1.17–1.31):0.98(0.93–1.06).

Length of body: 3.17(3.09–3.29).

TYPE DATA.—Holotype male (USNM 64417), "Guatemala [intercepted] Brownsville, Tex., 66430, 6-14-48-10336, *Sobralia* sp." Allotype female (USNM), "Guatemala, x-12-43, *Sobralia macrantha*, 43-19570 [intercepted] San Francisco, Cal. #18417." Paratypes as follows:

MEXICO: *No exact locality:* Intercepted at New Orleans, La., on pineapple, May 12, 1937, 1 female (USNM). *San Luis Potosí:* Tamazunchale, intercepted at Loredo, Tex., on orchid plant, Oct. 10, 1947, 1 female (USNM). Maíz, intercepted at Loredo, Tex., on *Laelis anceps*, May 19, 1947, 1 female (RCF). *Distrito Federal:* México, intercepted at Laredo, Tex., on *Lilium longiflorum*, Aug. 23, 1945, 2 females (USNM).

COSTA RICA: San José, June or July 1931, H. Schmidt, 1 female (KU).

DISCUSSION.—Although nearly all specimens studied had been collected in the United States, they had originated in Mexico and Guatemala and had been intercepted at quarantine stations upon their entry into this country. Judging from the number of interceptions, it appears that this species must occur in some abundance in Mexico and Guatemala. If such is the case, it is surprising that none of the collections examined in those countries had specimens collected there. This situation points up how poorly known is the fauna of certain countries, especially for groups that require specialized collecting techniques.

Melanaethus noctivagus (Van Duzee), new combination

PLATE FIGURES 67, 210

Geotomus noctivagus Van Duzee, 1923, p. 125.—Torre Bueno, 1939, p. 181.

DIAGNOSIS.—The short labium (reaching only to middle coxae) and the punctate depressed area between the calli (fig. 67) will permit recognition of this form among all those with a large terminal lobe on the peritreme.

DESCRIPTION.—MALE: Elongate-oval, widest at or immediately anterior to humeri.

Head: Length almost three-fourths of width, 0.59(0.56–0.61):0.79 (0.76–0.82); interocular width, 0.51(0.50–0.53); anterior outline a prolonged semicircle, clypeus as long as juga, weakly narrowed apically; surface with numerous moderate, well-separated punctures; with distinct, marginal carina dorsally; with no submarginal punctures; ocelli large, separated from eye by space less than twice transverse ocellar width; jugum ventrally and maxillary plate impunctate. Antennal segments: I, 0.16(0.14–0.18); II, 0.21(0.20–0.23); III, 0.21(0.20–0.23); IV, 0.29(0.27–0.31); V, 0.37(0.36–0.41). Bucculae higher than labial II, abruptly terminated posteriorly; labium extended to middle coxae. Labial segments: I, 0.21(0.20–0.24); II, 0.39(0.36–0.43); III, 0.26(0.25–0.28); IV, 0.24(0.22–0.26).

Pronotum: Length about half of width, 0.88(0.86–0.92):1.65(1.57–1.67); anterior margin deeply, simply emarginate; lateral margins straight and subparallel on basal third, posterior angle hidden by swollen lateral portion of posterior lobe, submarginally with six setigerous punctures bearing short, fine setae; transverse impression weak but distinct across full width, medially expanded posteriorly and anteriorly between calli as punctate basin (fig. 67); anterior lobe with strong punctures laterally and subapically, with scattered minute punctures on calli; posterior lobe distinctly punctate across full width, usually with much finer punctures between.

Scutellum: Longer than wide, 1.25(1.20–1.33):1.00(0.93–1.03); surface shining, and, except basal angles, with numerous large and small punctures.

Hemelytron: Clavus and corium polished; clavus with row of punctures double at base; mesocorium with two complete rows of punctures paralleling claval suture, elsewhere with numerous distinct punctures; exocorium more densely punctate than mesocorium; costa flattened and punctate, without setigerous punctures; membranal suture weakly sinuate, lateral angle feebly produced; membrane variable; longer than basal width in macropterous forms and shorter than basal width in brachypterous forms.

Propleuron: Anterior convexity alutaceous, with crowded small punctures on anterior half; depression with several coarse punctures.

Mesopleuron: Evaporatorium usually extended into posterolateral angle but not reaching lateral margin of segment; lateral area with numerous coarse punctures.

Metapleuron: Terminal lobe of peritreme large, reaching almost to convex lateral margin of somewhat limited evaporatorium; lateral area with numerous coarse punctures.

Legs: Anterior tibia with five or six stout spines on dorsal margin.

Sternites: Medially alutaceous and minutely punctate, laterally with numerous close, coarse punctures and longitudinal rugae.

Terminalia: Genital capsule shining, or weakly alutaceous, punctate, more densely so laterally, apical margin straight; gonostylus as illustrated (fig. 210).

Length of body: 3.60(3.46–3.74).

Female: Similar to male.

Head: Length-width ratio, 0.59(0.54–0.70):0.81(0.73–0.91); interocular width, 0.52(0.46–0.63). Antennals: I, 0.15(0.14–0.17); II, 0.21(0.20–0.23); III, 0.21(0.20–0.26); IV, 0.29(0.26–0.33); V, 0.37(0.33–0.40). Labials: I, 0.19(0.17–0.21); II, 0.38(0.36–0.41); III, 0.29(0.24–0.33); IV, 0.26(0.24–0.30).

Pronotum: Length-width ratio, 0.87(0.83–0.97):1.64(1.53–1.89).

Scutellum: Length-width ratio, 1.27(1.18–1.46):0.97(0.91–1.10).

Length of body: 3.49(3.17–4.01).

TYPE DATA.—The type male and paratype female (both in CalAc), were taken at San Carlos Bay, Sonora, Mexico.

SPECIMENS STUDIED.—14 males, 29 females.

UNITED STATES: *Arizona:* Atascosa Mt., Cochise Co., Douglas, Higley, Mesa, Oracle, Phoenix, Pima Co., Pleasant Lake, Thatcher, Yuma Co.; January, June, July, August. *California:* Coachella, Davis, San Diego; January, May, July. *Idaho:* Rupert; August. *New Mexico:* Las Cruces; June. *Texas:* Presidio Co., Valentine; July. *Washington:* Wilbur; March.

MEXICO: *Sonora:* Hermosillo, Pitiquito, San Carlos Bay; May, July.

DISCUSSION.—The placement of this species close to *pensylvanicus* on the basis of the punctation of the head was not justified by the material at hand. All material seen, including the female paratype from San Carlos Bay, Sonora, showed distinct and often crowded punctures on the head, not the minute punctation of *pensylvanicus.* This is in contradiction to Van Duzee's original description which reads, "superior surface minutely, obscurely, punctured." Comparison of specimens with the type will settle the question.

Melanaethus subglaber (Walker), new combination

PLATE FIGURE 213

Aethus subglaber Walker, 1867, p. 150.—Torre Bueno, 1939, p. 181.

Melanaethus elongatus Uhler, 1876, p. 280; 1877, p. 393; 1886, p. 3. New synonymy.

Geotomus parvulus Signoret, 1883, p. 208, pl. 4, fig. 170.—Lethierry and Severin, 1893, p. 72.—Banks, 1910, p. 100.—Van Duzee, 1917, p. 22.—Torre Bueno, 1939, p. 181. New synonymy

DIAGNOSIS.—Among the species of *Melanaethus* with the large terminal modification of the peritreme extending almost to the lateral margin of the evaporatorium, this one may be recognized by its very elongate form and the fact that the transverse impression is distinct across its entire width but not expanded medially.

DESCRIPTION.—MALE: Elongate-oval, slender for the genus, sides parallel.

Head: Length about three-fourths width, 0.63(0.62–0.64):0.82(0.80–0.86); interocular width, 0.53(0.50–0.56); anterior outline elongate, distinctly roundingly truncated, clypeus as long as juga, scarcely narrowed at apex; surface, including clypeus, with numerous crowded punctures; jugum with distinct marginal carina dorsally, with one submarginal puncture anterior to eye; jugum ventrally shining, impunctate; maxillary plate alutaceous, feebly punctate. Antennal segments: I, 0.17(0.16–0.20); II, 0.18(0.16–0.20); III, 0.22(0.22–0.23); IV, 0.27(0.26–0.30); V, 0.37(0.36–0.40). Bucculae higher than labial II, abruptly terminated posteriorly; labium reaching between middle

coxae. Labial segments: I, 0.23(0.21–0.24); II, 0.42(0.40–0.45); III, 0.30(0.28–0.32); IV, 0.22(0.21–0.24).

Pronotum: Length more than half of width, 0.85(0.81–0.92): 1.58(1.51–1.67); anterior margin shallowly, simply emarginate; lateral margin straight on basal half or more, submarginal row of five setigerous punctures; transverse impression postmedian, distinctly and almost equally depressed across full width, not marked by special row of punctures; anterior lobe with coarse, crowded punctures laterally and subapically, medially with fine punctures, calli with few minute punctures; posterior lobe shining, with numerous moderate punctures scattered nearly or quite to hind margin.

Scutellum: Length greater than width, 1.13(1.06–1.20):0.92(0.86–0.97); shining, with numerous well-separated punctures over surface except in basal angles.

Hemelytron: Clavus and corium shining, clavus with 1½ rows of punctures; mesocorium with two complete rows of punctures paralleling claval suture, elsewhere punctation sparse, fine, becoming little coarser towards base; exocorium punctate similar to mesocorium; costa thin, weakly reflexed on basal half, with one setigerous puncture dorsally near base; membranal suture straight, lateral angle not produced; membrane little longer than basal width, just attaining apex of abdomen.

Propleuron: Anterior convexity longitudinally rugopunctate; depression with few coarse punctures; prosternal carinae about as high as labial II, anterior margin long, vertical, produced ventrally as small, semicircular lobe.

Mesopleuron: Evaporatorium reaching into posterolateral angle, not attaining lateral margin of segment; lateral area shining, in part rugopunctate.

Metapleuron: Terminal modification of peritreme large, semicircular, reaching almost to lateral margin of evaporatorium; lateral area with several coarse punctures.

Legs: Anterior tibia with five or six stout spines dorsally.

Sternites: Polished, minutely punctate, with several weak rugae laterally near spiracular area.

Terminalia: Genital capsule shining, punctures becoming dense laterally, apical margin weakly decurved; gonostylus as illustrated (fig. 213).

Length of body: 3.33(3.16–3.55).

Female: Similar to male, most measurements averaging larger.

Head: Length-width ratio, 0.65(0.63–0.67):0.85(0.83–0.87); interocular width, 0.53(0.51–0.56). Antennal segments: I, 0.18(0.16–0.22); II, 0.20(0.18–0.23); III, 0.24(0.23–0.25); IV, 0.30(0.30–0.33);

V, 0.38(0.34–0.40). Labial segments: I, 0.24(0.23–0.26); II, 0.44 (0.42–0.46); III, 0.33(0.31–0.35); IV, 0.23(0.21–0.26).

Pronotum: Length-width ratio, 0.88(0.85–0.91):1.64(1.63–1.67).

Scutellum: Length-width ratio, 1.19(1.15–1.23):0.95(0.97–1.00).

Length of body: 3.46(3.43–3.50).

TYPE DATA.—Walker's type (BrM) was listed for the general territory of "North America"; Uhler's type (USNM) of *elongatus* came from "California."

SPECIMENS STUDIED.—112 males, 146 females.

UNITED STATES: *Arizona:* Aquila, Baboquivari Canyon (Pima Co.), Castle Hot Springs, Chiricahua Mts., Douglas, Florence, Gila Bend, Globe, Grand Canyon (Desert View), Indian Hot Spring, Nogales, Patagonia, Phoenix, Roosevelt Dam, Sabino Canyon (Santa Catalina Mts.), Thatcher, Tucson, Yuma, Warren; April to August. *California:* Borego Valley, Campo, Clayton, Coachella, Colton, Death Valley, Edison, Imperial Co., Lindsay, Los Angeles, Mt. Diablo, Needles, Niles Canyon (Alameda Co.), Oakland, Ojai, Orange, Palm Springs, Paso Robles, Ripley, San Bernardino, San Diego, San Felipe Valley (San Diego Co.), San Francisco, San Quentin, Santa Anna River, Santa Cruz, Sobabo Springs, Tanbark Flats (Los Angeles Co.); March to November. *Nevada:* Hoover Dam, Carson City, Las Vegas; June to August. *New Mexico:* Clovis; August. *Texas:* Concho, Dell City; July, August. *Utah:* Delta, Oasis; July, August.

MEXICO: *Sonora:* Hermosillo, Imuris, Pitiquito, San Bernardino; June, July. *Baja California:* Mesquital, San Fernando, San Ignacio; July.

ECUADOR: *Galápagos Islands:* Bindloe Island.

DISCUSSION.—The ecological notes on the specimens tell little about the habits of the species because they represent the usual collecting places for members of the family: i.e., at lights and under objects on the ground. There is one specimen, however, which does bear an interesting label which the author prefers to disbelieve. The specimen is labeled "Sao Paulo, Brazil(!), San. F. 23832, VII–8–47–10080." The Brazilian locality would suggest that the specimen was from that country, while the abbreviation "San F." indicates that it was intercepted in commerce at that quarantine station. Since San Francisco is within the known range of *parvulus* and Brazil is very far removed from it, the author prefers to interpret this as a case of contamination after the products to be examined arrived in California.

The "*Aethus subglaber*" of Walker has long been an enigma to heteropterists, but personal examination of the type leaves no doubt that the name is correct for this species.

In 1883 Signoret transferred Uhler's species and Herrick-Schaeffer's (1839, p. 97) *Cydnus elongatus* into *Geotomus*, making Uhler's species a junior homonym of Herrick-Schaeffer's species and proposing for it the new name *parvulus*.

***Melanaethus pensylvanicus* (Signoret), new combination**

PLATE FIGURE 212

Cydnus (*Melanaethus*) *picinus* Uhler, 1876, pl. 19, fig. 17 (figured, but not mentioned in text).
Melanaethus picinus Uhler, 1877, p. 391 (designated as "new sp."); 1886, p. 3.
Geotomus pensylvanicus Signoret, 1883, p. 207, pl. 4, fig. 169.—Lethierry and Severin, 1893, p. 72.—Banks, 1910, p. 100.—Van Duzee, 1917, p. 22.—Torre Bueno, 1939, p. 181.

DIAGNOSIS.—Among the species of *Melanaethus* with the large terminal lobe on the peritreme, this one may be recognized by having the head impunctate or with scattered minute punctures.

DESCRIPTION.—MALE: Oval, widest behind midlength.

Head: Length almost two-thirds width, 0.54(0.50–0.56):0.84(0.83–0.86); interocular width, 0.52(0.52–0.53); anterior outline a strongly flattened semicircle, clypeus as long as juga, narrowed apically; dorsum distinctly convex, with several minute punctures scattered over surface; with distinct marginal carina dorsally; submarginally with three widely separated setigerous punctures; ocelli moderate, separated from eye by space more than twice transverse ocellar width; jugum ventrally shining, impunctate; maxillary plate with crowded punctures. Antennal segments: I, 0.15(0.13–0.16); II, 0.16(0.16–0.17); III, 0.19(0.17–0.23); IV, 0.24(0.23–0.26); V, 0.31 (0.30–0.33). Bucculae about as high as labial II, abruptly terminated posteriorly; labium attaining bases of middle coxae. Labial segments: I, 0.24(0.23–0.27); II, 0.39(0.36–0.43); III, 0.28(0.26–0.32); IV, 0.23(0.23–0.26).

Pronotum: Length more than half width, 0.93(0.93–0.94):1.74 (1.72–1.79); anterior margin shallowly, simply emarginate; lateral margin straight on basal third or half, with submarginal row of five or six setigerous punctures; transverse impression postmedian, obsolete, not marked by special row of punctures; anterior lobe with lateral patch of distinct punctures, with several minute punctures medially and scattered over calli; posterior lobe with numerous fine punctures across full width.

Scutellum: Length greater than width, 1.25(1.25–1.28):1.09(1.08–1.11); surface, except basal angles, with scattered intermixed minute and moderate punctures.

Hemelytron: Clavus and corium polished; clavus with one or two partial rows of punctures in addition to the complete one; mesocorium with two complete rows of punctures paralleling claval suture, elsewhere with scattered punctures becoming coarser and closer basally; exocorium with irregular punctation, punctures most numerous subcostally; costa straight on basal third, diverging, with one setigerous puncture located dorsally near base; membranal suture straight,

lateral angle not produced; membrane longer than basal width, reaching or slightly surpassing apex of abdomen.

Propleuron: Alutaceous, with minute punctures on anterior convexity and several coarser ones in depression; prosternal carinae less than half as high as labial II, more or less abruptly terminated posteriorly.

Mesopleuron: Evaporatorium attaining posterolateral angle but not lateral margin of segment; lateral area with numerous oblique rugulae.

Metapleuron: Terminal lobe of peritreme a large, irregular semicircle reaching almost to straight lateral margin of evaporatorium; lateral area shining, with few rugae paralleling evaporatorium.

Legs: Anterior tibia with five or six stout spines dorsally.

Sternites: Shining and minutely punctate medially, laterally with distinct punctures and longitudinal rugae.

Terminalia: Genital capsule finely alutaceous, more closely punctate laterally; gonostylus as illustrated (fig. 212).

Length of body: 3.42(3.30–3.56).

Female: Similar to male.

Head: Length-width ratio, 0.56(0.51–0.60):0.84(0.83–0.86); interocular width 0.52(0.52–0.53). Antennal segments: I, 0.15(0.14–0.16); II, 0.17(0.16–0.20); III, 0.18(0.16–0.20); IV, 0.24(0.23–0.26); V, 0.31 (0.30–0.33). Labial segments: I, 0.24(0.23–0.27); II, 0.39(0.36–0.43); III, 0.28(0.26–0.32); IV, 0.23(0.23–0.26).

Pronotum: Length-width ratio, 0.95(0.90–1.00): 1.82(1.74–1.92).

Scutellum: Length-width ratio, 1.34(1.26–1.41):1.14(1.12–1.16).

Length of body: 3.45(3.31–3.59).

Type data.—The type specimen (USNM) was reported by Uhler as having come from Pennsylvania.

Specimens studied:

United States: *Alabama:* Anniston; July. *Arkansas:* Pike Co., Washington Co.; May, September. *Florida:* Pensacola; October. *Georgia:* Atlanta, Savannah; March, May, July. *Illinois:* Charleston; September. *Kansas:* Douglas Co., Lyons Co., Manhattan; May, June. *Louisiana:* Bossier Parish, Baton Rouge, Logansport; April, May. *Maryland:* "Md.," Hagerstown; March, June, November. *Mississippi:* Gulfport, Hamilton; April, July, December. *Missouri:* Carthage, Lincoln, Phelps; May, June. *Nebraska:* Lincoln; May. *North Carolina:* Moore Co., Southern Pines; July. *Oklahoma:* Calera Grove; December. *Tennessee:* Knoxville; May. *Virginia:* Falls Church, Leesburg; April.

Discussion.—When Signoret (1883) transferred Uhler's *Cydnus picinus* and Stål's (1853, p. 215) *Aethus picinus* to *Geotomus*, Stål's use of the name had priority and Signoret was obliged to rename Uhler's species. He called it "*pensylvanicus*," using but one "n" originally, according to usage in French at that time.

Uhler's name *picinus* must date from 1876 even though it was not described in words until 1877. In 1876 Uhler presented a habitus sketch and on the caption for the plate used the name *Melanaethus picinus*. In view of the lack of ecological comments in literature concerning this species, the following notes copied from labels of specimens examined should be especially interesting: "on okra," "swept grasses," "tanglefoot trap posts," "from soil, peach orchard" and "under litter, peach orchard."

Melanaethus planifrons, new species

Plate figure 214

Diagnosis.—The enlarged terminal lobe of the peritreme reaching close to the lateral edge of the evaporatorium plus the presence of three or four setigerous punctures submarginally on the head will easily separate this species from all others in the genus.

Description.—Male: Elongate-oval, sides parallel.

Head: Length about three-fourths width, 0.99(0.96–1.02):1.22(1.16–1.27); interocular width, 0.86(0.82–0.90); anterior outline semicircular, juga longer than clypeus, contiguous beyond it; surface shining, nearly smooth, or with weak to prominent radiating rugae, with patches of numerous small punctures scattered on higher parts; jugum with distinct marginal carina dorsally, submarginally with row of three or four setigerous punctures; ocelli moderate, situated distinctly posterior to line connecting hind margin of strongly oblique eyes, removed from eye by space about four times transverse ocellar width; jugum ventrally and maxillary plate, except base, shining, impunctate. Antennal segments: I, 0.30(0.30–0.33); II, 0.39(0.35–0.43); III, 0.37(0.34–0.40); IV, 0.46(0.41–0.50); V, 0.52(0.49–0.60). Bucculae as high as labial II, evanescent posteriorly; labium reaching between middle coxae. Labial segments: I, 0.41(0.40–0.43); II, 0.65(0.65–0.66); III, 0.49(0.43–0.56); IV, 0.40(0.37–0.43).

Pronotum: Length not over half width, 1.35(1.17–1.44): 2.71(2.47–2.82); anterior margin deeply, doubly emarginate; lateral margin weakly incurved basally, then straight for more than half length, with submarginal row of six or seven setigerous punctures; transverse impression postmedian, obsolete to distinct, marked by irregular, medially interrupted row of coarser punctures; anterior lobe with mixture of coarse and fine punctures in broad lateral band and in narrow line in moderate, subapical impression; posterior lobe with scattered minute punctures and a few distinct punctures medially.

Scutellum: Length greater than width, 1.88(1.69–1.97):1.59(1.36–1.69); shining, with several widely scattered minute and coarse punctures discally.

Hemelytron: Clavus and corium polished, clavus usually with one row of punctures, sometimes with partial second row; mesocorium with one complete and one medially interrupted row of punctures paralleling claval suture, elsewhere obsoletely or minutely punctate; exocorium with punctures of various sizes scattered along length; costa convex dorsally, with one, or rarely two, setigerous punctures; membranal suture straight, lateral angle not produced; membrane longer than basal width, surpassing apex of abdomen.

Propleuron: Weakly alutaceous to shining, with few distinct punctures in depression; prosternal carinae about as high as labial II, abruptly rounded off posteriorly.

Mesopleuron: Evaporatorium reaching lateral margin of segment; lateral area shining, with few oblique rugae.

Metapleuron: Terminal modification of peritreme somewhat transverse, polished only along posterior margin, distinctly separated from lateral margin of evaporatorium by space less than diameter of the lobe; lateral area polished, impunctate.

Legs: Anterior tibia with six to eight stout spines dorsally.

Sternites: Shining, minutely punctate, with few coarse punctures and weak, longitudinal rugae laterally.

Terminalia: Genital capsule shining, with small, shallow emargination apically; gonostylus as illustrated (fig. 214).

Length of body: 5.38(4.79–5.77).

FEMALE: Similar to male, lacking punctate subapical impression on pronotum.

Head: Length-width ratio, 0.98(0.94–1.03):1.24(1.16–1.30); interocular width, 0.86(0.80–0.90). Antennal segments: I, 0.30(0.30–0.32); II, 0.37(0.35–0.40); III, 0.36(0.34–0.40); IV, 0.47(0.43–0.53); V, 0.54(0.49–0.63). Labial segments: I, 0.40(0.36–0.43); II, 0.70(0.68–0.73); III, 0.51(0.48–0.56); IV, 0.38(0.36–0.41).

Pronotum: Length-width ratio, 1.35(1.19–1.49):2.70(2.47–2.93).

Scutellum: Length-width ratio, 1.99(1.85–2.18):1.61(1.43–1.69).

Length of body: 5.26(4.81–5.82).

TYPE DATA: Holotype male (USNM 64418), "Lower California, Pacific Slope, Calexico, Cal., vi–30–40." Allotype female (USNM), same data. Paratypes as follows:

UNITED STATES: *Arizona:* Elroy Aug. 4, 1932, E. D. Bell, 4 females (USNM). Patagonia, July 1936, E. S. Ross, 1 male (CalAc). Oak Creek Canyon, July 9, 1941, L. H. Beamer, 1 male, 1 female (KU). Salt River Valley, October 1933, A. F. Swain, 4 males, 3 females, 2 nymphs (RLU) and (in lettuce) 1 male, 1 female, 2 nymphs (CalAc). San Luis, Yuma Co., Aug. 11, 1940, E. C. Van Dyke, 2 females (CalAc). Tucson, July 7, 1949, R. H. and L. D. Beamer, 5 females (KU); July 29, 1924, E. P. Van Duzee, 1 male (CalAc). Yuma, Aug. 6, 1948, C. and P. Vaurie, 1 female (AmM). *California:* Brawley, Oct. 14, 1936, A. T. McClay, 1 female (McC). Dos Palos (Merced Co.), Aug. 14, 1947, V. M. Stern, 1 male

(CIS). El Centro, July 24, 1938, R. H. Beamer, 1 female (KU). Fort Yuma, Aug. 21, 1924, E. P. Van Duzee, 2 females (CalAc). Holtville, April, February 1945, sugar beet, 1 female (USNM). Imperial Co., July 14, W. Benedict, 3 females (KU). Imperial Valley, March, W. M. Davidson, 1 female (USNM). Los Angeles, Oct. 15, 1917, E. P. Van Duzee, 1 female (CalAc). Palo Verde (Imperial Co.), Aug. 27, 1946, P. D. Hurd, 1 female (CIS). Ripley, Riverside Co., July 26–27, 1946, P. D. Hurd, 1 male, 2 females (CIS). Santa Ana Canyon, Nov. 2, 1934, 1 male (LAMus). Selma, July 17, 1947, R. C. Bechtel, 1 female (McC).

Mexico: *Baja California:* Mexicali, Aug. 20, 1942, purslane leaves, 1 female (USNM). 20 miles south of Palacio, April 1939, Michener, 1 male (CalAc). *Sinaloa:* Los Mochis, June 27, 1922, C. T. Dodds, 1 male, 1 female (CalAc); same locality and collector, July 4, 1922, 1 male (CalAc). *Sonora:* Hermasillo, Apr. 19, 1897, Koebele Collection, 1 male (CalAc). Navajo, Aug. 3, 1953, C. and P. Vaurie, 1 male, 2 females (AmM). Ciudad, Obregon, July 29, 1952, C. and P. Vaurie, 19 males, 27 females (AmM). Pitiquito, July 4, 1952, C. and P. Vaurie, 11 males, 36 females (AmM). Tiburón Island (north end), July 9, 1952, C. and P. Vaurie, 1 male, 1 female (AmM). Yavaros, July 31, 1952, C. and P. Vaurie, 7 males, 16 females (AmM).

Discussion.—The several specimens that bore determination labels were identified as *Geotomus semilevis* Signoret. Because Signoret's illustration of that species shows the peritreme without a specially modified terminal lobe such application of the name cannot be supported. In the present paper *semilevis* is considered to be a synonym of *Dallasiellus lugubris.*

On two occasions this insect had been collected in association with cultivated plants. Some of the Arizona specimens were labeled "in lettuce," while one California specimen was noted as having come from "sugar beet."

Melanaethus punctatissimus (Signoret), new combination

Geotomus punctatissimus Signoret, 1883, p. 216, pl. 5, fig. 180.

Diagnosis.—The long narrow body (length about twice as great as width of pronotum) plus the mixture of two sizes of punctures on the posterior pronotal lobe mark this species as distinct from the others in the genus.

Description.—Based on the type female.

Female: Elongate, sides parallel.

Head: Length about three-fourths width, 0.63:0.82; interocular width, 0.56; anterior outline semicircular; surface decidedly convex, with crowded, distinct punctures; ocelli tiny, separated from eye by a space subequal to an ocellar width; juga with fine marginal carina dorsally, shining and impunctate ventrally; maxillary plate impunctate. Antennal segments: I, 0.16; II, 0.15; III, 0.21; IV, 0.23; V, missing. Bucculae almost as high as labial II, abruptly terminated posteriorly; labium reaching between middle coxae. Labial segments: I, 0.30; II, 0.35; III, 0.31; IV, 0.23.

Pronotum: Length about half width, 0.78:1.62; anterior margin moderately singly emarginate; lateral margin slightly converging from base, more strongly rounded anteriorly, with submarginal row of five setigerous punctures; transverse impression obsolete, absent medially, not marked by a row of special punctures; anterior lobe, except for most of calli and oblique strip in anterior angles, with a broad band of punctures anteriorly, laterally and posteriorly; calli with a few minute punctures; transverse impression, posterior lobe and extreme hind margin with a mixture of coarse and fine punctures.

Scutellum: Length-width ratio, 1.20:0.88; shining, surface, except basal angles, with irregularly scattered moderate and fine punctures intermixed and becoming finer and more uniform toward apex.

Hemelytron: Polished, clavus with one complete and one partial row of punctures; mesocorium with numerous well-separated punctures, the discal ones, like those in the two rows paralleling the claval suture, becoming coarser toward base; exocorium with fewer and finer punctures than mesocorium; costa thin, slightly reflexed, with a single subbasal setigerous puncture dorsally; membranal suture feebly sinuate, lateral angles not projecting; membrane about as long as basal width, just reaching tip of abdomen.

Propleuron: Anterior convexity, except dorsally and posteriorly, with numerous net-like rugae; fewer punctures in the depression; prosternal carinae about as high as labial II, gradually terminated posteriorly.

Mesopleuron: Evaporatorium reaching almost to posterolateral angle; with few punctures anteriorly.

Metapleuron: Terminal modification of peritreme moderate, extending about two-thirds of way across supporting plate; lateral area with a few moderate to fine punctures near lateral margin of evaporatorium.

Sternites: Polished, punctuate and/or horizontally rugose laterally.

Length of body: 3.19.

Type data.—Signoret gave the locality of the type as "Sitka." This agrees with the specimen in the Signoret Collection which also bears the name "Kolenati." This must be the type female (Wien).

Discussion.—Examination of type specimen made possible the recognition of this species, which the author at first considered to be a synonym of *subglaber*. The elongate form does suggest that it is close to *subglaber* but the lack of a strong transverse impression and the two sizes of punctures on the posterior pronotal lobe and site of the transverse impression will separate the two. Signoret's illustration in his monograph is misleading in not showing the calli as being polished with only a patch of minute punctures medially and in indicating the

scutellum to have uniform, close-set punctures. Actually the punctures of the scutellum are of two sizes and are irregularly scattered.

Perhaps collectors in British Columbia and coastal Alaska will rediscover this species in nature and tell us something of its habits.

Melanaethus robustus Uhler, revived combination

PLATE FIGURES 13, 23, 50, 96, 120, 144, 215

Melanaethus robustus Uhler, 1877, p. 390; 1886, p. 3.
Geotomus (*Melanaethus*) *robustus* Signoret, 1883, p. 59, pl. 4, fig. 168.
Geotomus robustus Lethierry and Severin, 1893, p. 73.—Banks, 1910, p. 100.—Van Duzee, 1917, p. 22.—Torre Bueno, 1939, p. 181.

DIAGNOSIS.—The coarse, close punctation of the head, the intermixed coarse and fine punctation of the posterior pronotal lobe and the large size (3.6–4.2) will readily separate this species from all others of the genus that exhibit the large terminal modification of the peritreme.

DESCRIPTION.—MALE: Broadly oval, widest behind midlength.

Head: Length three-fourths width, 0.62(0.60–0.65):0.88(0.86–0.93); interocular width, 0.63(0.61–0.66); anterior outline semicircular, clypeus as long as or very slightly longer than juga, scarcely narrowed apically; surface shining (fig. 50), with numerous coarse punctures, many of them contiguous with distinct marginal carina dorsally, with one setigerous puncture submarginally; ocelli very small, far behind line connecting posterior margins of eyes, removed from eyes by space greater than four times transverse ocellar width; jugum ventrally shining, impunctate; maxillary plate rugopunctate. Antennal segments: I, 0.16(0.15–0.20); II, 0.15(0.15–0.16); III, 0.19(0.17–0.23); IV, 0.25(0.23–0.27); V, 0.38(0.36–0.40). Bucculae (fig. 23) higher than labial II, abruptly terminated posteriorly; labium attaining middle coxae. Labial segments: I, 0.24(0.24–0.26); II, 0.50(0.47–0.53); III, 0.37(0.35–0.40); IV, 0.25(0.23–0.30).

Pronotum: Length less than half width, 0.97(0.93–1.03):2.01(1.96–2.08); anterior margin moderately, singly emarginate; lateral margin straight on basal half, without submarginal setigerous punctures; transverse impression obsolete, sometimes absent medially, not marked by special row of punctures; anterior lobe, except calli and their anterior projection into the lateroapical angles, with numerous moderate to coarse, closely crowded punctures, calli with few minute punctures; transverse impression and posterior lobe very closely punctate laterally, discally with numerous fine punctures and few to many coarse ones intermixed.

Scutellum: Length greater than width, 1.31(1.29–1.33):1.19(1.17–1.23); shining, surface, except basal angles, with numerous coarse

punctures (usually with fine ones intermingled) becoming finer apically.

Hemelytron: Clavus and corium polished; clavus with one complete row of punctures and basal part of another; mesocorium with two complete rows of punctures paralleling claval suture, disc with numerous distinct punctures becoming coarser basally; exocorium irregularly but mostly more densely punctate than mesocorium; costa wide, thin, gently reflexed to form a shallow, open trough on basal third, without setigerous punctures; membranal suture straight, lateral angle not produced; membrane longer than basal width, reaching apex of abdomen.

Propleuron: Anterior convexity with numerous, close, anastomosing rugulae; with few coarse punctures in depression; prosternal carinae not as high as labial II, convexly terminated posteriorly.

Mesopleuron (fig. 96): Evaporatorium reaching almost to lateral margin of segment; lateral area with several coarse punctures.

Metapleuron (fig. 96): Terminal modification of peritreme large, reaching almost to lateral margin of evaporatorium; lateral area with band of numerous punctures near evaporatorium.

Legs: Anterior tibia with six or seven stout spines dorsally.

Sternites: Medially shining and minutely punctate, lateral fourth with small punctures and numerous short, longitudinal rugulae.

Terminalia: Genital capsule shining, almost uniformly punctate, apical margin straight; gonostylus as illustrated (fig. 215).

Length of body: 3.71(3.62–3.76).

FEMALE: Similar to male.

Head: Length-width ratio, 0.63(0.59–0.67):0.93(0.90–0.98); interocular width, 0.64(0.62–0.69). Antennal segments: I, 0.19(0.17–0.21); II, 0.17(0.15–0.20); III, 0.22(0.21–0.24); IV, 0.28(0.26–0.30); V, 0.40(0.38–0.43). Labial segments: I, 0.27(0.26–0.29); II, 0.55(0.50–0.60); III, 0.38(0.36–0.40); IV, 0.26(0.25–0.31).

Pronotum: Length-width ratio, 1.06(1.04–1.12):2.03(1.90–2.13).

Scutellum: Length-width ratio, 1.43(1.34–1.52):1.15(1.10–1.23).

Length of body: 3.82(3.59–4.07).

TYPE DATA.—Uhler's type specimens (USNM) were reported as having come from "Maryland, near Baltimore," and "Andover, Mass."

SPECIMENS STUDIED.—29 males, 46 females.

UNITED STATES: *District of Columbia:* Washington; June. *Florida:* Dunedin; December. *Illinois:* Catlin, Jacksonville, Muncie, Urbana, White Heath; March, May, June, September, October, December. *Indiana:* Marion Co.; August. *Iowa:* Ames, Indianola; March, April, June. *Kansas:* Douglas Co., Lawrence; June. *Maryland:* Plummer's Island; April, August. *Mississippi:* Natchez; May. *Missouri:* Columbia, Kimmswick, New Hartford, Ranken, Springfield; June, July. *New Jersey:* Gloucester; June. *Ohio:* Delaware Co., Whitman Beach (Ashtabula Co.); June, July. *Pennsylvania:* Harrisburg, Jeannette, Philadelphia,

Pittsburgh, Washington Co.; March, September. *Texas:* Concho Co., Victoria; February, August. *Virginia:* Deer Run, Great Falls; June.

Discussion.—The only ecological note on any specimen was "woods ground cover" on a small series from Illinois.

Melanaethus spinolae (Signoret), revived combination

Plate figure 216

Aethus spinolae Signoret, 1863, p. 545, pl. 12, fig. 12.—Walker, 1867, p. 152.—Stål, 1876, p. 27 ("loc. incert.").
Melanaethus spinolae Uhler, 1877, p. 392.
Geotomus (Cydnus) spinolai Signoret, 1883, p. 209, pl. 4, fig. 172.
Geotomus spinolai Uhler, 1886, p. 3.—Lethierry and Severin, 1893, p. 74.—Barber and Bruner, 1932, p. 238.
Geotomus minusculus Jensen-Haarup, 1926, p. 50. New synonymy.

Diagnosis.—The small size (2.7–3.2) and the thick, almost calloused margin of the head, which has no dorsal carina and is unarmed except for a single, submarginal setigerous puncture in front of eye, mark this species as very distinct.

Description.—Male: Elongate-oval, sides subparallel.

Head: Length about two-thirds width, 0.52(0.50–0.54):0.74(0.73–0.76); interocular width, 0.44(0.43–0.46); anterior outline angled, side margins convex, clypeus longer than juga; margin thick, almost calloused, without dorsal carina, with one submarginal setigerous puncture next to eye; surface, including clypeus, shining, with scattered fine but distinct punctures; ocelli moderate, separated from eye by space less than twice transverse ocellar width; jugum ventrally and maxillary plate (except basally) shining, impunctate. Antennal segments: I, 0.16(0.15–0.18); II, 0.19(0.16–0.20); III, 0.21(0.20–0.23); IV, 0.25(0.23–0.26); V, 0.32–0.31–0.33). Bucculae about as high as labial II, abruptly terminated posteriorly; labium reaching between middle coxae. Labial segments: I, 0.21(0.20–0.23); II, 0.42(0.41–0.46); III, 0.30(0.29–0.32); IV, 0.19–0.23).

Pronotum: Length half width, 0.70(0.67–0.74) :1.46(1.43–1.50); anterior margin moderately, simply emarginate; lateral margin straight on basal third, basally concealed from above by slightly swollen sides of posterior lobe, with submarginal row of four or five setigerous punctures; transverse impression submedian, obsolete to absent, not marked by special row of punctures except laterally; anterior lobe laterally with patch of fine and moderate punctures, anteriorly and medially with fine punctures, calli with few minute punctures; posterior lobe finely punctate medially, punctures coarser towards sides.

Scutellum: Length greater than width, 1.15(1.15–1.16):0.91(0.90–0.93); surface shining, with numerous minute to fine punctures, these becoming coarser apically.

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Hemelytron: Clavus and corium shining, very feebly alutaceous; clavus with one complete row of punctures and few punctures at base; mesocorium with two complete rows of punctures paralleling claval suture, disc with numerous distinct punctures; exocorium with median row of distinct, close-set punctures; costa thin, sharp, depressed, with one setigerous puncture dorsally near base; membranal suture feebly convex, lateral angle slightly produced; membrane longer than basal width, slightly surpassing apex of abdomen.

Propleuron: Anterior convexity alutaceous, with numerous obsolete to feeble punctures and rugulae, depression with several coarse punctures; prosternal carinae less than half as high as labial II.

Mesopleuron: Evaporatorium restricted, extended two-thirds across posterior margin of segment; lateral area finely rugulose.

Metapleuron: Terminal lobe of peritreme large, almost reaching to side margin of evaporatorium; lateral area with number of close-set, elongate, coarse punctures.

Legs: Anterior tibia with four stout spines dorsally.

Sternites: Shining, very faintly alutaceous, minutely punctate, lateral fourth roughened by numerous small, close rugae.

Terminalia: Genital capsule shining, scattered punctures becoming numerous in depressed lateral angles, apical margin straight, with small, prominent tooth medially (sometimes broken off); gonostylus as illustrated (fig. 216).

Length of body: 3.01(2.94–3.07).

FEMALE: Similar to male.

HEAD: Length-width ratio, 0.52(0.50–0.56):0.75(0.72–0.81); interocular width, 0.43(0.40–0.47). Antennal segments: I, 0.15(0.15–0.16); II, 0.17(0.16–0.20); III, 0.21(0.17–0.25); IV, 0.25(0.23–0.30); V, 0.34(0.32–0.37). Labial segments: I, 0.21(0.20–0.23); II, 0.37(0.36–0.40); III, 0.26(0.23–0.30); IV, 0.23(0.21–0.26).

Pronotum: Length-width ratio, 0.72(0.70–0.76) :1.50(1.46–1.57).

Scutellum: Length-width ratio, 1.22(1.14–1.31):0.93(0.90–1.00)

Length of body: 2.92(2.74–3.18).

TYPE DATA.—Location of the types unknown to the author. Signoret originally described *spinolae* as coming from Chile. Jensen-Haarup described the type (Copen) of *minusculus* from Lagôa Santa, Brazil.

SPECIMENS STUDIED.—4 males, 82 females.

PANAMA: *Canal Zone:* Ancón, Barro Colorado Island, Corozal; April.

DOMINICAN REPUBLIC: Barahona, south side of Lake Enriquillo; September.

BRITISH GUIANA: Bartica.

BRAZIL: Corumba (Matto Grosso), Espírito-Santo, Distrito Federal, Rio de Janeiro, São Paulo; February, June, November, December.

PARAGUAY: Chaco, Grand Chaco; June.

ARGENTINA: *Misiones:* Bemberg, Iquazu; February, March.

Discussion.—The few ecological comments on specimens examined were the usual "at lights," implying that these insects are active after dusk.

None of the specimens studied showed the tubercles described and figured with the original description. In fact, in his later "Revision," Signoret himself did not again mention such a modification.

The synonymizing of *minusculus* Jensen-Haarup with this species is based on comparison of undoubted specimens of the latter with the type of *minusculus*. This comparison was made by Dr. S. L. Tuxen.

Melanaethus subpunctatus (Blatchley), new combination

Plate figure 217

Geotomus subpunctatus Blatchley, 1926, p. 78.—Torre Bueno, 1939, p. 181.

Diagnosis.—The virtual absence of large punctures from the transverse impression and posterior lobe of the pronotum coupled with the broadly reflexed costa will separate this species from all others in the genus.

Description.—Male: Broadly oval, widest at midlength.

Head: Length more than half width, 0.66(0.62–0.67):1.00(0.99–1.03); interocular width, 0.65(0.63–0.69); anterior outline semicircular, often flattened, clypeus as long as juga, not much narrowed apically; surface shining, with numerous crowded punctures; with marginal carina dorsally; ocelli small, separated from eye by space nearly twice transverse ocellar width; jugum ventrally and maxillary plate (except basally) shining, impunctate. Antennal segments: I, 0.18(0.16–0.20); II, 0.20(0.17–0.23); III, 0.20(0.20–0.21); IV, 0.23(0.23–0.26); V, 0.30(0.30–0.34). Bucculae higher than labial II, abruptly terminated posteriorly; labium reaching between middle coxae. Labial segments: I, 0.26(0.25–0.30); II, 0.53(0.50–0.58); III, 0.40(0.37–0.44); IV, 0.28(0.25–0.33).

Pronotum: Length about half width, 1.09(1.04–1.17):2.12(2.02–2.22); Anterior margin deeply, doubly emarginate; lateral margin straight on basal half or two-thirds, with one submarginal setigerous puncture at apical angle or none; transverse impression obsolete to absent, not marked by special row of punctures; anterior lobe with numerous crowded, coarse punctures laterally, and in a band paralleling anterior margin, calli with scattered minute punctures; posterior lobe with widely scattered minute punctures medially, closer coarser ones laterally.

Scutellum: Length equal to or longer than width, 1.35(1.24–1.43):1.27(1.24–1.32); shining, with numerous minute punctures and very few coarse ones, both becoming more numerous towards apex.

Hemelytron: Basal width across both hemelytra usually slightly wider than pronotum; clavus with one row of punctures; mesocorium

with one complete row of punctures, apically with minute, widely scattered punctures becoming coarser and closer towards base; exocorium explanate, at base wider than radial vein, faintly reflexed, more densely punctate than mesocorium; costa thin, sharp, without setigerous punctures; membranal suture straight, lateral angle not produced; membrane longer than basal width, almost or quite reaching apex of abdomen.

Propleuron: Anterior convexity with several irregular, longitudinal carinae and few punctures; depression with few coarse punctures; prosternal carina about half as high as labial II, roundingly terminated posteriorly.

Mesopleuron: Evaporatorium reaching into posterolateral angle, not attaining lateral margin of segment; lateral area with several longitudinal rugae.

Metapleuron: Terminal modification of peritreme large, reaching almost to lateral margin of evaporatorium; lateral area with few rugae.

Legs: Anterior tibia with six or seven stout spines dorsally.

Sternites: Shining, minutely punctate, with few weak rugae and punctures laterally near spiracular area.

Terminalia: Genital capsule shining, with numerous punctures, apical margin straight; gonostylus as illustrated (fig. 217).

Length of body: 3.97(3.88–4.12).

Female: Similar to male, measurements averaging larger.

Head: Length-width ratio, 0.64(0.60–0.70):1.02(1.00–1.09); interocular width, 0.66(0.63–0.71). Antennal segments: I, 0.20(0.20–0.21); II, 0.22(0.20–0.24); III, 0.21(0.20–0.23); IV, 0.25(0.23–0.30); V, 0.31(0.30–0.34). Labial segments: I, 0.30(0.30–0.32); II, 0.56(0.50–0.60); III, 0.42(0.41–0.44); IV, 0.30(0.27–0.35).

Pronotum: Length-width ratio, 1.09(1.04–1.17):2.20(2.14–2.34).

Scutellum: Length-width ratio, 1.40(1.36–1.50):1.29(1.23–1.37).

Length of body: 4.08(3.91–4.35).

Type data.—Blatchley described this species from Dunedin, Fla., Wilmington, N.C., and Plum Point, Md. Some of these types are in the collection of Purdue University, Lafayette, Ind.

Specimens studied.—14 males, 20 females.

United States: *Alabama:* Mobile; November. *Arkansas:* Hope; May. *Florida:* Alachua Co., Gainesville, Lake County, Lake Placid, Newberry, Sanford, Tampa; February to May and August to November. *Georgia:* Savannah; September. *Louisiana:* Bossier Parish, Hart; April. *Maryland:* Cove Point, Plum Point; March, August. *North Carolina:* Southern Pines, Wilmington; April. *Texas:* Tyler; February. *Virginia:* Trammel's Landing (Potomac River); April.

Discussion.—Two of the types were reported by Blatchley (loc. cit.) to have been "sifted from vegetable debris" in Florida. The

Louisiana specimens seen bore the notation "under litter, peach orchard." Several specimens were identified as "*Geotomus robustus*."

Melanaethus uhleri (Signoret), revived combination

Plate figure 218

Geotomus (*Melanaethus*) *uhleri* Signoret, 1883, p. 211, pl. 5, fig. 174.—Lethierry and Severin, 1893, p. 74.—Banks, 1910, p. 100.—Van Duzee, 1917, p. 22.—Torre Bueno, 1939, p. 181.
Melanaethus uhleri Uhler, 1886, p. 3.

Diagnosis.—Among the species of *Melanaethus* with the large terminal modification of the peritreme this one may be recognized by the fact that the punctation on the middle of the posterior pronotal lobe is much finer than that found laterally and that the costae, which are straight and subparallel on the basal half, are neither explanate nor recurved.

Description.—Male: Elongate, widest behind midlength.

Head: Length two-thirds width, 0.62(0.60–0.66):0.96(0.94–1.01); interocular width, 0.63(0.63–0.66); anterior outline a flattened semicircle, clypeus very slightly longer than juga, weakly narrowed apically; juga, clypeus and interocular space variously punctate; with fine, distinct, marginal carina dorsally; ocelli small, separated from eye by space about three times transverse ocellar width; jugum ventrally dull or shining, maxillary plate strongly alutaceous. Antennal segments: I, 0.18(0.17–0.21); II, 0.19(0.16–0.22); III, 0.23(0.22–0.24); IV, 0.32(0.30–0.34); V, 0.36(0.36–0.40). Bucculae almost twice as high as labial II, abruptly terminated posteriorly; labium reaching middle of mesosternum. Labial segments: I, 0.26(0.25–0.27); II, 0.44(0.43–0.46); III, 0.30(0.30–0.32); IV, 0.27(0.23–0.30).

Pronotum: Length more than half width, 1.11(1.04–1.17):2.08(2.02–2.15); anterior margin moderately, simply emarginate; lateral margin straight on basal third or half, with submarginal row of seven or eight setigerous punctures; transverse impression virtually absent, its postmedian site not marked by special row of punctures; anterior lobe with numerous strong punctures subapically and laterally, elsewhere with scattered minute punctures; posterior lobe minutely punctured medially, more strongly so laterally.

Scutellum: Longer than wide, 1.42(1.36–1.46):1.25(1.17–1.30); disc polished, with scattered small punctures absent in basal angles, becoming more numerous apically.

Hemelytron: Clavus and corium polished; clavus with two or three rows of punctures; mesocorium with two complete rows of punctures paralleling claval suture, large punctures of main area becoming very coarse basally; exocorium more abundantly punctate, declivent basally to flattened costa; costa without setigerous punctures; membranal

suture nearly straight, lateral angle weakly produced; membrane little longer than basal width, slightly surpassing apex of abdomen.

Propleuron: Front half of anterior convexity with crowded, prominent, longitudinal rugae and few punctures; depression with few coarse punctures; prosternal carinae more than half as high as labial II, abruptly terminated posteriorly.

Mesopleuron: Evaporatorium reaching into posterolateral angle, not to lateral margin of segment; lateral area strongly rugopunctate anterior to evaporatorium.

Metapleuron: Terminal modification of peritreme very large, semicircular, reaching lateral margin of evaporatorium; lateral area with several strong punctures.

Legs: Anterior tibia with six stout spines dorsally.

Sternites: Polished, minutely punctate on middle half, coarsely rugopunctate on lateral fourth.

Terminalia: Genital capsule punctate, more closely so laterally, apical margin very weakly sinuate medially; gonostylus as illustrated (fig. 218).

Length of body: 3.99(3.91–4.09).

Female: Similar to male, measurements usually averaging larger.

Head: Length-width ratio, 0.65(0.65–0.66):1.01(1.00–1.04); interocular width, 0.68(0.66–0.70). Antennal segments: I, 0.21(0.20–0.23); II, 0.20(0.20–0.23); III, 0.25(0.23–0.26); IV, 0.32(0.30–0.33); V, 0.37(0.36–0.40). Labial segments: I, 0.28(0.27–0.30); II, 0.44(0.43–0.46); III, 0.35(0.33–0.37); IV, 0.30(0.30–0.30).

Pronotum: Length-width ratio: 1.18(1.10–1.23):2.21(2.15–2.28).

Scutellum: Length-width ratio, 1.52(1.49–1.56):1.34(1.30–1.36).

Length of body: 4.11(3.91–4.25).

Type data.—*M. uhleri* was described by Signoret from "Amerique du Nord." The type from the Signoret collection (Wien), was examined. It is labeled "Morrison, Geog. Am., 1877. I" and agrees with the above treatment except that the contrast between the punctures of the transverse impression and those laterally is slightly less than in most specimens.

Specimens studied.—6 males, 34 females.

United States: *Alabama:* Gadsden; May. *Arkansas:* Howard Co., Pike Co., Washington Co.; February, May, September. *Georgia:* Morrison (type). *Kansas:* Lawrence; July. *Oklahoma:* Grove; May. *Tennessee:* Hamilton Co., Roane Co.; April, May. *Texas:* Benchley, Brownsville, Calvert, Columbus, Denton, Devil's River, Gainesville, Kerrville; January, April, May, August.

Discussion.—Signoret's statement that the terminal lobe of the peritreme in this species is like that of the European *Geotomus punctulatus* is erroneous. The lobe here is quite typical for the present genus, being flat, with outline convex posteriorly, and with osteole

opening posteriorly on the peritreme, although the trough from the opening does extend onto the mesal part of the lobe.

One of the specimens from Texas was labeled as having been collected on parsnip, *Pastinaca sativa.* Blatchley (1926, p. 78) reported specimens as having been "swept from herbage in low, moist meadows."

Genus *Pangaeus* Stål

Pangaeus Stål, 1862, p. 95.
Homaloporus Uhler, 1877, p. 376. New synonymy.

Diagnosis.—The unmodified terminal part of the peritreme coupled with the presence of an impressed, subapical line which extends from side to side on the pronotum will separate *Pangaeus* from all other genera of Cydnidae.

Description.—Size small to medium, oval, widest approximately at or slightly behind middle; dorsum much less convex than venter.

Head (figs. 24, 46–49): Distinctly broader than long, dorsum distinctly depressed to moderately convex; juga as long as or longer than and more or less convergent in front of clypeus, with a fine marginal carina above; submargin with one to six setigerous punctures, or a complete row from eye to apex of jugum; eyes large, moderately projecting; ocelli well developed, located on or behind a line connecting hind margins of eyes; antennae 5-segmented, II usually shortest, V longest; bucculae low, usually not as high as labial II; labium reaching between middle coxae, II longest, slightly compressed but not foliaceously lobed, IV shortest.

Pronotum: Wider than long, distinctly narrowed from near base; side margins carinate, submarginal row of 5 to 9 or 18 to 20 setigerous punctures; anterior margin moderately to slightly concave, with a collum distinctly limited posteriorly by a sharply impressed line extending from one anterior angle to the other (even when punctured this line is distinct across its full width); transverse impression submedian, usually rather distinct and with a row of punctures; posterior margin broadly, shallowly convex; all angles rounded.

Scutellum: Longer than wide, triangular; apex narrowed, width less than half length of membranal suture; disc sparsely to abundantly punctured.

Hemelytron: Corial areas well-defined; membranal suture straight, lateral angle somewhat acute; costa with one to twelve setigerous punctures; membrane not over two-fifths of hemelytral length, surpassing apex of abdomen.

Propleuron: Impunctate or with few punctures in depression; prosternal carinae low, distinct.

Mesopleuron: Flattened; evaporatorium either entire (fig. 103) and reaching uninterrupted in posterolateral angle of segment (subgenus

Pangaeus) or limited (figs. 102, 104) laterally and posteriorly and not reaching into posterolateral angle (subgenus *Homaloporus*).

Metapleuron (figs. 103, 104): Flattened; osteole opening posteriorly on peritreme; latter not surpassing middle of segment, apex not differentiated; evaporatorium occupying mesal two-thirds of segment, outer margin variously concave; polished lateral space impunctate.

Legs: Moderately long; anterior tibia (fig. 127) compressed, with nine to ten stout spines dorsally, not or only slightly surpassing tarsal insertion; middle and posterior tibiae usually slender, latter modified in shape and spine arrangement in males of several species (figs. 152–159).

Sternites: Alutaceous to polished; with one or two lateral submarginal setigerous tubercles; sutures entire or finely denticulate.

Type of genus.—*Aethus margo* Dallas (1851), subsequently designated by Van Duzee (1914, p. 378). The name *margo* as well as several others have been found to be synonyms of *Cimex aethiops* Fabricius. Further data on this synonymy can be found in the discussion of *Pangaeus aethiops*. The type of subgenus *Homaloporus* is *congruus* Uhler by nature of Uhler's monobasic proposal for his generic name.

Distribution.—A New World genus, *Pangaeus* ranges throughout North America from southern Canada (Provancher, 1886) south through Central America and the West Indies into South America as far south as Argentina and Uruguay. The two "species," *douglasi* and *scotti*, that Signoret (1882) described from Australia and New Zealand respectively may or may not have been correctly labeled. Study of the types of both of these species shows that they were based on undoubted specimens of the common North American species *bilineatus* (Say). For further information on this see the remarks under *Pangaeus bilineatus*.

Discussion.—The name "*Homaloporus*" has long been maintained in full generic status for one North American and one South American species which resembled members of the genus *Pangaeus* in having an impressed, subapical line on the pronotum, but differing in possessing a submarginal row of pegs on the head. As the present study progressed and the value of the head vestiture for generic separation lessened, a reevaluation of the relationships of these two "genera" became necessary.

The presence of an undifferentiated apex of the peritreme coupled with the impressed subapical line on the pronotum definitely allied these two taxa and separated them from all other Cydnidae. Experimental joining of the two revealed such a startling similarity of development between the northern members of each and between the southern members of each that one could not believe this to be a case

of convergence but rather a reflection of fundamental relationships. And even the separation offered by the presence or absence of the submarginal row of pegs on the head was in part bridged by the discovery of a new species from North America which possessed a partial row of submarginal pegs. Therefore, the two forms formerly assigned to "*Homaloporus*" must now be considered as members of *Pangaeus* and the former name synonymized under the latter where it is available for subgeneric naming as is proposed below.

The combination of the two features given in the diagnosis above sets this genus apart so sharply from other cydnid genera that it is somewhat surprising to find that there has been some confusion concerning its limits. The emphasis formerly placed on the vestiture of the head could justify the old separation of "*Homaloporus*" and *Pangaeus*, but even so, the latter taxon was not clearly delimited in other directions. The confusion actually started with Uhler's (1877) assignment of his new species *discrepans* to *Pangaeus* with the remark, "the transverse line interrupted in the middle, remotely, coarsely punctate." The type of *discrepans* has no collum or limiting impressed line, thus, Uhler's statement that the line was "interrupted" has been misleading. Not only was *discrepans* carried thus as a *Pangaeus*, but another species, *californicus*, without a collum was described and erroneously assigned to the genus by Blatchley (1929). Blatchley did, however, recognize that both of these species were in the wrong genus and suggested that a change would have to be made. In the present study, both of these species have been transferred to the genus *Dallasiellus*.

From the studies on which this revision was based, from a close examination of Signoret's revision, from Distant's (1899) attempt to clarify the status of Walker's several species, and from notes on the types in several museums it is clearly evident that there has been excessive splitting of species in this genus. Many of the earlier workers apparently assumed that every specimen from a new locality represented a new species—giving little or no thought to the possibility of widespread species. Others based their descriptions on teneral or badly mutilated specimens or overemphasized minor differences, real or imaginary. The resulting confusion can be cleared away only by a drastic synonymizing of names.

The genus *Pangaeus* is readily divisible into two groups which the author chooses to designate as subgenera. One occurs from Guatemala northward and the other from Mexico southward. They are most reliably separated by the shape of the mesopleural evaporatorium. The southern subgenus, which contains the type of the genus and must be called *Pangaeus*, has the mesopleural evaporatorium extended uninterruptedly into the posterolateral angle (fig. 103); while the

northern subgenus, which contains the type of "*Homaloporus*" and so must take that name, has the evaporatorium very restricted, it being separated from the posterolateral angle of the sclerite by the polished lateral area (fig. 103). Subgenus *Homaloporus*, in most of its species, has more setigerous punctures laterally than does nominal *Pangaeus*. In the former subgenus all species except *rugiceps* bear two or more submarginal setigerous punctures distad of the preocular one; and normally have two or more costal setigerous punctures. In nominal *Pangaeus* all but four closely allied species of the dozen included forms have no setigerous punctures distad of the preocular one, and, with four exceptions, the number of costal setigerous punctures is usually one or two with only an occasional specimen showing three—the exceptions being *subtilius*, *xanthopus*, *pluripunctatus*, new species, and *semibrunneus*, new species, each of which has five to ten such costal punctures.

The shape of the mesopleural evaporatorium alone furnishes the most reliable feature for separating these subgenera and permits the forming of the following couplet:

Key to subgenera of *Pangaeus*

1. Mesopleural evaporatorium extending uninterrupted along posterior margin of sclerite into posterolateral angle (fig. 103) **Pangaeus (Pangaeus)** (p.477)
   Mesopleural evaporatorium limited, separated from posterolateral angle and posterior margin of sclerite by polished area (figs. 102, 104).
   Pangaeus (Homaloporus) (p.458)

Subgenus *Pangaeus* (*Homaloporus*) Uhler, new status

Diagnosis.—The limited mesopleural evaporatorium (figs. 102, 104), which does not reach into the posterolateral angle of the segment, sets this subgenus apart from the nominal subgenus.

Description.—The generic description as modified by the notes in the generic discussion will furnish sufficient characterization for this subgenus.

Type of subgenus.—*Homaloporus congruus* Uhler, monobasic.

Distribution.—This subgenus occupies the northern part of the range of the genus from Guatemala north into the United States, where it is known to occur as far north as New York, Iowa, and Nebraska east of the Great Plains and west from Texas across New Mexico and Arizona into southern California.

Discussion.—*Pangaeus rugiceps* Horváth might be considered somewhat intermediate between this subgenus and the nominal one on the basis of the reduction of the number of setigerous punctures on the submargin of the head and costa. However, the shape of the mesopleural evaporatorium, which the author considers a better phylogenetic indicator, clearly places it in the subgenus *Homaloporus*.

Key to species of subgenus *Pangaeus* (*Homaloporus*)

1. Ventral surface of posterior femur with numerous scattered, small tubercles (fig. 154); posterior tibia of male distinctly angulate ventrally near base (fig. 153) 2
   Posterior femur not tuberculate ventrally; posterior tibia of male simple, not angled ventrally near base 3
2. Submargin of head with a double set of setigerous punctures, those on anterior third or half giving rise to short pegs, on posterior part giving rise to long hairs (fig. 49) . . . . **setosus,** new species (p. 473)
   Submargin of head with four to five setigerous punctures giving rise to long slender hairs (similar to fig. 47) but no pegs. **tuberculipes,** new species (p. 475)
3. Juga and clypeus with a complete submarginal row of pegs (fig. 33). **congruus** (Uhler) (p. 467)
   Juga and clypeus without a row of pegs 4
4. Juga with three or more setigerous punctures submarginally; surface of head neither strongly convex nor strongly rugose 5
   Jugum with one submarginal setigerous puncture immediately anterior to eye; dorsum of head strongly convex, usually with strong transverse rugae (fig. 48) . . . . **rugiceps** Horváth (p. 471)
5. Subapical impressed line of pronotum with a row of distinct punctures; corium not alutaceous . . . . **punctilinea,** new species (p. 470)
   Subapical impressed line of pronotum impunctate; corium distinctly alutaceous. **bilineatus** (Say) (p. 459)

Pangaeus (*Homaloporus*) *bilineatus* (Say)

Plate figures 104, 220

Cydnus bilineatus Say, 1825, p. 315.
Cydnus rugifrons Herrick-Schaeffer, 1839, p. 97, pl. 177, p. 547.
Cydnus rugifrons "loc. inc." Stål, 1876, p. 26.
Cydnus femoralis Herrick-Schaeffer, 1839, p. 98, pl. 177, p. 548.
Aethus bilineatus Dallas, 1851, p. 117.—Walker, 1867, p. 150.
Aethus femoralis Walker, 1867, p. 150.
Aethus ? femoralis Walker, 1868, p. 534.
Aethus fortis Walker, 1867, p. 151.
Pangaeus bilineatus Stål, 1876, p. 19.—Uhler, 1877, p. 383; 1886, p. 3.—Distant, 1880, p. 6.—Lethierry and Severin, 1893, p. 69.—Banks, 1910, p. 100.—Van Duzee, 1917, p. 21.—Torre Bueno, 1939, p. 180.—Sailer, 1954, p. 41, figs. 1–8.
Pangaeus femoralis Stål, 1876, p. 19.
Pangaeus rugifrons Uhler, 1877, p. 384; 1886, p. 3.—Lethierry and Severin, 1893, p. 70.
Pangaeus rufifrons (lapsus) Distant, 1880, p. 7.
Pangaeus fortis Distant, 1880, p. 6.—Uhler, 1886, p. 3.—Lethierry and Severin, 1893, p. 69.
Pangaeus ? fortis Uhler, 1877, p. 389.
Pangoeus [!] *fortis* Signoret, 1882, p. 246, pl. 8, fig. 105.
Pangoeus [!] *uhleri* Signoret, 1882, p. 253, pl. 9, fig. 112.
Pangoeus [!] *bilineatus* Signoret, 1882, p. 254, pl. 9, fig. 113.
Pangoeus [!] *vicinus* Signoret, 1882, p. 255. New synonymy.
Pangoeus [!] *douglasi* Signoret, 1882, p. 258, pl. 9, fig. 115. New synonymy.
Pangoeus [!] *scotti* Signoret, 1882, p. 259, pl. 9, fig. 117. New synonymy.

Pangoeus [!] *spangbergi* Signoret, 1882, p. 259, pl. 9, fig. 116. New synonymy.
Pangaeus spangbergi Uhler, 1886, p. 3.—Lethierry and Severin, 1893, p. 70.—Banks, 1910, p. 101.—Van Duzee, 1917, p. 21.—Torre Bueno, 1939, p. 180.
Pangaeus uhleri Uhler, 1886, p. 3.—Lethierry and Severin, 1893, p. 70.—Banks, 1910, p. 101.—Van Duzee, 1917, p. 21.
Pangaeus douglasi Lethierry and Severin, 1893, p. 69.
Pangaeus scotti Lethierry and Severin, 1893, p. 70.
Pangaeus vicinus Lethierry and Severin, 1893, p. 70.

Diagnosis.—As can be deduced from the key to species, *bilineatus* is probably best characterized within the subgenus mostly by negative characters: (1) no tubercles on ventral surface of posterior femora; (2) no punctures in subapical impression of the pronotum; and (3) the presence of three or more submarginal setigerous punctures on each jugum.

Description.—Male: Oval, widest behind the middle.

Head: Length about two-thirds width, 1.20(1.03–1.26):1.76(1.58–1.87); interocular width, 1.09(0.96–1.16); anterior outline a full semicircle or less, usually evenly curved; clypeus usually as long as juga, little narrowed apically; jugum submarginally with three to five setigerous punctures, usually with feeble to obsolete radiating rugae; surface somewhat convex, punctures obsolete or absent; ocelli moderately large, separated from eye by a space less than twice transverse ocellar width; jugum ventrally and maxillary plate (except basally) polished, impunctate. Antennal segments: I, 0.34(0.28–0.40); II, 0.32(0.27–0.43); III, 0.40(0.30–0.46); IV, 0.47(0.34–0.56); V, 0.50(0.36–0.60). Bucculae almost as high as labial II; labium reaching between middle coxae. Labial segments: I, 0.60(0.50–0.66); II, 0.90(0.73–1.00); III, 0.73(0.70–0.78); IV, 0.46(0.36–0.50).

Pronotum: Length more than half of width, 2.04(1.69–2.28):3.73(3.24–3.97); anterior margin moderately, simply emarginate; side margins entire, nearly straight on middle third, lateral submarginal row of nine to twelve setigerous punctures; transverse impression submedian, obsolete to absent, impunctate or marked by irregular row of distinct punctures; anterior lobe impunctate or sometimes with few (one to five) weak punctures laterally; posterior lobe impunctate or with few to a dozen punctures medially.

Scutellum: Length equal to or slightly longer or shorter than width, 2.31(1.95–2.53):2.32(2.02–2.47) surface obsoletely alutaceous (not polished), with numerous punctures discally except across base and at extreme apex.

Hemelytron: Corium and clavus distinctly alutaceous; clavus usually with one or two partial rows of distinct punctures; mesocorium with one complete and a second partial or complete row of punctures paralleling claval suture, disc obsoletely, rarely distinctly punctured; exocorium with numerous punctures usually more distinct than those

of mesocorial disc; costa with two to six setigerous punctures; membranal suture weakly bisinuate, lateral angle slightly produced; membrane longer than basal width, distinctly surpassing apex of abdomen.

Propleuron: Distinctly alutaceous, punctured only in depression; prosternal carinae less than half as high as labial II, acute.

Mesopleuron and metapleuron: As in figure 103.

Legs: Moderately long; posterior femora not tuberculate ventrally; posterior tibiae not angulate ventrally near base.

Sternites: Distinctly alutaceous, impunctate.

Terminalia: Genital capsule alutaceous, punctured laterally, apical margin weakly emarginate medially; gonostylus as illustrated (fig. 220).

Length of body: 6.87(5.85–7.46).

Female: Very similar to male. Head: Length-width ratio, 1.14 (0.88–1.30):1.72(1.33–1.94). Antennal segments I, 0.34(0.28–0.40); II, 0.32(0.27–0.43); III, 0.40(0.30–0.46); IV, 0.47(0.34–0.56); V, 0.50(0.36–0.60). Labial segments: I, 0.53(0.41–0.63); II, 0.87(0.63–1.03); III, 0.69(0.43–0.81); IV, 0.49(0.41–0.54).

Pronotum: Length-width ratio, 1.97(1.61–2.30):3.55(2.22–4.23).

Scutellum: Length-width ratio, 2.22(1.69–2.47):2.26(1.69–2.61).

Length of body: 6.64(5.25–7.78).

Type data.—*Cydnus bilineatus* was described by Say with the comments "Inhabits the United States . . . . Not uncommon in Pennsylvania as well as in Missouri." Say's collection has been destroyed, but in the T. W. Harris collection (MCZ) there are a number of specimens that Say determined for Harris. Since very few Say-determined specimens are still in existence, these generally have been accepted as substitutes for the types of Say's species. Of this collection Uhler (1878, p. 365) stated: "this collection is of especial interest at the present time, because it is the only one preserved in this country which contains original and authentic types of the Hemiptera described by Mr. Say." Specimen No. 135 in the Harris collection bears the data, "Florence, Ala., January and February, 1836, Prof. Hentz." Of it Uhler (1878, p. 371) wrote: "Having examined the type of Dr. Fitch, I am enabled to refer it to this species." As indicated by the year of the collection quoted above, this specimen cannot be the original type because it was not captured until some 10 years after the desciption appeared.

The location of the types of Herrick-Schaeffer's two species, *Cydnus femoralis* and *C. rugifrons*, is not known to the author. *C. femoralis* was described from "aus Lankaster [Pennsylvania?] in Nordamerika," *rugifrons* "aus Georgian in Amerika."

The type (BrM) of *Aethus fortis* was described by Walker (1867, p. 151) from "Oajaca," Mexico.

As indicated in the synonymy of the species, Signoret (1882) described five forms which he erroneously thought to be distinct from *bilineatus*. They were *douglasi* from "Australia," *scotti* from "Nouvelle-Zelande," *spangbergi* from "Texas," *uhleri* from "Caroline et Georgie," and *vicinus* from "Guayaquil." The types of *douglasi* and *scotti* are in the Naturhistorisches Museum in Vienna, while the type of *spangbergi* is in the Naturhistoriska Riksmuseum in Stockholm. The location of the type of *vicinus*, which was described from "Guayaquil," apparently is not in the major Signoret collection in Vienna. Since *uhleri* was proposed for those specimens from South Carolina and Georgia which Uhler (1877, p. 385) had determined as *rugifrons* of Herrick-Schaeffer, those Uhler specimens must comprise the type lot; they are in the Uhler collection (USNM).

SPECIMENS STUDIED.—352 males, 408 females.

UNITED STATES: *Alabama:* Auburn, Burnsville, De Soto State Park, Florala, Mobile, Tuscaloosa Co.; April to July. *Arkansas:* Hope, Hot Springs, Washington Co.; July, October. *Arizona:* Alamo Canyon (Pima Co.), Baboquivari Mts., Buckeye, East Fort Lowell, Globe, Oracle, Patagonia, Phoenix, Sabino Canyon, Thatcher, Tucson, Yuma; June to September. *California:* Holtville, Indio, Palm Springs, Riverside; May, June. *Florida:* Alachua Co., Coconut Grove, Crescent City, Deerfield, De Land, Fort Lauderdale, Fort Myers, Fruitville, Gainesville, Hollywood, Homestead, Juniper Springs, LaSalle, Lacooches, Lakeland, Lake Placid, Liberty Co., Miami, Moore Haven, Okeechobee, Palm Beach, Plant City, Quincy, Royal Palm Park, Sanford, Zolfo Springs; all months. *Georgia:* Atlanta, Bainbridge, Billy's Island (Okefenokee Swamp), Bueno Vista, DeWitt, Eaton, Pamona, St. Simon's Island, Thomasville, Vidalia; April to November. *Illinois:* Ashmore, Catlin, Charleston, Collinsville, Olive Branch, Urbana; March, April, July to October. *Indiana:* Hanover, Harrison Co., Terre Haute; May to August. *Iowa:* Ames, Kelso, Muscatine, Pleasant Valley; April to September. *Kansas:* Baldwin, Douglas Co., Lawrence, Leavenworth, Onaga; May to July. *Louisiana:* Baker, Buras, Creole, Harahan, New Orleans; June to August. *Maryland:* Plummer's Island; September. *Massachusetts:* No exact locality. *Mississippi:* Handsboro, Jackson, August. *Missouri:* Aldrich, Carthage, Columbia, Gray Summit, Kansas City, Kirkwood, Perry Co., St. Louis, Van Buren; April to August. *Nebraska:* Crete Inn. *New Jersey:* Palisades, Snake Hill; October. *New York:* Ithaca, Long Island, New York, Pelham, Sea Cliff; May, July, November. *North Carolina:* Ashville, Black Mountain City, Edenton, McDowell Co.; May to August. *Oklahoma:* Alva, Hobart, Osage Co., Payne Co., Smithville; May to September. *Pennsylvania:* Chestnut Hill, Jeannette, Philadelphia; July, September. *South Carolina:* Aiken Co., Blaney, Charleston, Clemson, Florence, Fort Jackson, Spartanburg; May to September. *South Dakota:* Elk Point; August. *Tennessee:* Knoxville, Reelfoot Lake; April, May. *Texas:* Abilene, Aransas Co., Brazoria Co., Brownsville, Canadian, Cedar Lane, Colorado City, Colorado Co., Corpus Christi, Dallas, Del Rio, Devil's River, Harlingen, Hidalgo Co., Lake Kemp, Navasota, Palacios, Peeler, Port Arthur, San Angelo, San Antonio, Sherman, Terrell, Three Rivers, Uvale, Waco; April to August. *Virginia:* Falls Church, Great Falls; May to July, October. *West Virginia:* Cheat Mts., Jackson's Mill, Lewis Co.

MEXICO: *Coahuila:* Monclova, San Pedro de Colonias (3,700 feet); August. *Durango:* Nombre de Dios (5,900 feet); August. *Distrito Federal:* "El Guard,"

Peñón de Marquis; March, November. *Guerrero:* Balsas, Iguala; September. *Hidalgo:* "Guerrero Mills," Tizayuca; November. *Jalisco:* Guadalajara; February. *Baja California:* Comondú, Miraflores, San Domingo, Triunfo; July. *México:* Tejupilco; June. *Michoacán:* El Sabine, 12 miles south of Tzitzio on Huetano road; July. *Morelos:* Cuernavaca; May, November. *Puebla:* Northern slope (11,000 feet) of Mt. Popocatepetl; November. *San Luis Potosí:* El Salto; June. *Veracruz:* "Lococos," Minatitlán; February, July.

Guatemala: *Zacapa:* Zacapa; February, July.

Bermuda: No exact locality; May.

Discussion.—The range indicated by specimens studied extended across the eastern half of the United States from Massachusetts south to Florida and Bermuda, west to South Dakota, Nebraska, Kansas, Oklahoma, and Texas, thence through Arizona into southern California, and south into Mexico and Guatemala. The type localities of Signoret's two synonyms, *douglasi* and *scotti*, were given as "Australia" and "Nouvelle-Zelande." These countries are not here considered to be part of the established distribution of the species. More detailed discussion of this matter is given below.

The extensive range occupied by *bilineatus* brings it under many and varying environmental conditions. In adapting to these conditions the insect may be expected to show several modifications. Such variation was recognized and noted by Uhler as early as 1877. In material seen during the present study these variations were present in bewildering array. The anterior outline of the head varied from a full semicircle to a flattened one; the surface of the head ranged from smooth and impunctate to distinctly but weakly rugose (*rugifrons* Herrick-Schaeffer) with scattered fine punctures; and the number of the submarginal setigerous punctures on each jugum ranged from three to five. The number of these setigerous punctures may have some significance, but variability included unlike numbers on the two sides of one individual as well as unlike numbers on specimens from the same locality, especially as the material from farther north was studied. In contrast to this, the southern material appeared to have a tendency toward few and more regularly arranged submarginal punctures, until in Mexican specimens each jugum usually has one or two close-set punctures immediatedly anterior to the eye and two more widely separated ones beyond. Antennal II, while usually shorter than III, sometimes was subequal to it.

Pronotal punctation showed variation in the number and size of punctures laterally on the anterior lobe, medially on the posterior lobe and in the transverse impression. The number of costal setigerous punctures ranged from two to five, not uncommonly differing in number on the two sides of one specimen. The shape of the lateral margin of the metapleural evaporatorium was almost straight in some individuals and weakly to strongly concave in others. The length of the

body shows great difference between the smallest and largest specimens seen, 5.25 to 7.78 mm; the smaller specimens were all from the southern part of the range, with the smallest being from Bermuda. But not all southern specimens are small; many of them are as large as any of the northern ones, and intermediate sizes exist; consequently, the name *uhleri* is not necessary for the smaller specimens.

Depending on the maturity of the individual at the time of its death, the color varied from yellowish brown through reddish brown and piceus ("var. a. *picea*" of *bilineatus* Say, 1825) to black with the legs, particularly the femora, often being reddish brown (*femoralis* Herrick-Schaeffer). These above-mentioned variations have been confusing, but since nearly any one of them may be found in any part of the range, there can be no other conclusion but that only one quite variable species is involved.

The application of Say's name *bilineatus* employed here is that commonly followed by all other workers. *Pangeus bilineatus* is considered the common species of the eastern United States. Since most of Say's collection has been destroyed, it is quite probable that the type of *bilineatus* was destroyed with it. This leaves the species without a type, but since the presently used assignment is so universally adopted there can be little objection to continuing the practice. Although Signoret apparently intended to follow this plan, his figure 113 on plate 9 of his 1882 "Revision" shows one important difference from all specimens of the species seen during this study. No specimen showed the quadrate terminal appendage to the osteolar peritreme. Without doubt, this misrepresentation aided Signoret in separating several "new species" from *bilineatus*. Considering in order the older names and those doubtful Signoret species of which Signoret material was available for study, the reasons for synonymizing the names are given below.

Herrick-Schaeffer's two species, *Cydnus rugifrons* from "Georgien in Amerika" and *Cydnus femoralis* from "Lankaster aus Nordamerika," were described from individual variants as indicated in the present discussion of the variation that occurs in this species (supra).

Walker's *Aethus fortis* from Mexico. Notes on the type furnished by Dr. China confirm the general acceptance of this name as a synonym of *bilineatus*.

Pangoeus vicinus Signoret, "Guayaquil." A female specimen in the Signoret collection (Wien) is labeled "*vicinus* det Signoret," but does not bear a type label. In addition, the specimen is labeled as being from "Mexico," not from the type locality given in the original description. In view of the description of the limited mesopleural evaporatorium of *vicinus* and the present study revealing no members of the subgenus *Homaloporus* from the South American continent,

the "Guayaquil" locality appears to be in error. The Mexican locality is included within the presently determined range of the subgenus. Assuming, at least temporarily, that Signoret's determination represents his concept of *vicinus*, one is confronted with certain discrepancies between the specimen and the original description. In the latter he points out the similarity to *bilineatus* and reports a difference in the apex of the peritreme—a character already shown (supra) to be nonexistent in *bilineatus*. He recorded a single costal seta, where the Mexican specimen shows three setigerous punctures. His description of the cephalic bristles is of the primary setae, not of the submarginal setigerous punctures which consist of four close-set punctures immediately anterior to the eye and one more widely removed beyond. This Mexican specimen also lacks antennals II to V, so the characters pertaining thereto cannot be verified, but the described condition fits the variations accepted in the present study for *bilineatus*. The description of the punctation of the pronotum, scutellum, corium, and venter agrees both with the Mexican specimen and *bilineatus* as here understood. Since discrepancies of this sort are numerous in Signoret's cydnid work—even where the type itself was available for study—one should not attach too much importance to them. So, with apparently no characters for separating *vicinus* from *bilineatus*, the former must be considered a synonym of the latter.

Pangoeus douglasi Signoret, "Australia," and *Pangoeus scotti* Signoret, "Nouvelle-Zelande." Although these two species were described from areas well-removed from the native range of the genus, examination of the types (Wien) leaves no doubt of their synonymy with *bilineatus*. Signoret was undoubtedly misled by the distant localities and his own error in figuring the apex of the peritreme of *bilineatus*. Two possible explanations may be offered for the remote type localities. The simplest is that the specimens were mislabeled. The second is that the specimens may have been carried to these localities by commerce. Being burrowers, they could easily be scooped into the holds of ships with soil that was added for ballast and then be unloaded to make room for a cargo; or they could have travelled in soil about the roots of plants. In either event, neither *douglasi* nor *scotti* appears to have been reported from its original type locality by subsequent authors, except on the authority of Signoret's original descriptions. There is, however, a specimen (MCZ) labeled as coming from the Society Islands. Although no further data are given on the label, this record plus those of Signoret's specimens lend plausibility to the theory that *bilineatus* can be readily transported by commerce.

Pangoeus spangbergi Signoret, "Texas." The type specimen (Stock) was loaned for study and proved to be a Belfrage specimen. Signoret's comparison of this with *P. moestus*, a member of the nominal subgenus,

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apparently misled him into describing his specimen as new. Signoret's (1882, pl. 9, fig. 116) illustration does not agree with the type in the following respects: (1) head has submarginal setigerous punctures arranged four close-set in front of eye and one more widely spaced beyond, not as pictured; (2) on the pronotum the lateral punctures are much fewer in number and the posterolateral angles are neither so prominent nor sharp as shown; (3) apex of scutellum is shown too long and narrow; (4) hemelytron of type has only one row of punctures on clavus, fewer and more irregularly spaced punctures on mesocorium and more punctures on exocorium; (5) both evaporatoria are misrepresented—mesopleural evaporatorium shown as acute, while it is rounded in the type, and that of metapleuron does not extend to anterolateral margin of segment as shown in the figure; and (6) the posterior emargination of the peritreme does not show the large hooklike blade visible in the illustration. The author was unable to find any feature to separate the type from *bilineatus*.

The name *uhleri* was proposed by Signoret for the Carolina and Georgia specimens which Uhler (1877, p. 385) had identified as *Pangaeus rugifrons* (Herrick-Schaeffer). Uhler's use of *rugifrons* was in the same sense that it had been proposed, for a species of the southeastern United States. Thus *uhleri* must be considered a synonym of *rugifrons*, which, in turn, is considered to be the same as *bilineatus*. Signoret's (1822, p. 252) transfer of the name *rugifrons* to Mexican species was erroneous, so Horváth (1919, p. 236) proposed the name *rugiceps* for the Mexican form.

As with most other species in the family, the biology and ecology of this insect is poorly known. The author's experience with it is that it may be quite common in an area and still be rarely collected. Intensive field work in St. Louis, Mo., and adjacent territory had yielded less than a half dozen specimens in more than 20 years, and these always under debris on the ground. Yet, when it became possible to examine the miscellaneous insect material collected in the Japanese beetle traps in the St. Louis area, several times that many specimens would be seen in one week. Apparently, these insects had been attracted to the eugenol or geranol that had been used as an attractant for the Japanese beetles. Judging from certain published notes, this species may be quite injurious to cultivated plants. Cassidy (1939, p. 322) reported it as doing "serious damage to cotton" in Arizona. In the same year, Tissot (1939, p. 455) wrote: "pepper seed beds at Fort Myers [Florida] being severely damaged. Beds mulched with grass and weeds, which probably was the cause of the bugs congregating in such large numbers."

***Pangaeus (Homaloporus) congruus* (Uhler), new combination**

Plate figures 12, 33, 102, 125, 152, 219

Homaloporus congruus Uhler, 1877, p. 377; 1886, p. 3.—Signoret, 1881b, p. 330, pl. 10, fig. 47.—Lethierry and Severin, 1893, p. 65.—Banks, 1910, p. 100.—Torre Bueno, 1939, p. 178.

Homaloporus pangaeiformis Signoret, 1881b, p. 331, pl. 11, fig. 48.—Uhler, 1886, p. 3.—Lethierry and Severin, 1893, p. 66.—Van Duzee, 1917, p. 19.—Torre Bueno, 1939, p. 178. New synonymy.

Aethus ferrugineus Signoret, 1882, p. 40, pl. 2, fig. 82.—Uhler, 1886, p. 3. New synonymy.

Cydnus ferrugineus Lethierry and Severin, 1893, p. 66.

Description.—Male: Oval, widest behind middle.

Head: Length about two-thirds width, 0.84(0.82–0.90):1.25(1.20–1.36); interocular width, 0.85(0.80–0.93); anterior margin a slightly flattened semicircle, clypeus as long as juga; eyes projecting by one-half their length; surface shining, nearly smooth, impunctate. Antennal segments: I, 0.24(0.23–0.26); II,0.22(0.20–0.23); III, 0.27(0.26–0.30); IV, 0.30(0.30–0.33); V, 0.34(0.33–0.36). Bucculae (fig. 33) about half as high as labial II, evanescent posteriorly. Labial segments: I, 0.43(0.40–0.50); II, 0.53(0.50–0.60); III, 0.51(0.46–0.60) IV, 0.33(0.30–0.36).

Pronotum: Length slightly more than half width, 1.45(1.30–1.69):2.76(2.47–3.06); anterior margin shallowly, doubly emarginate; lateral margin straight in basal two-thirds, submarginally with 18 to 20 setigerous punctures; transverse impression somewhat postmedian, weak to obsolete, marked by incomplete row of moderate punctures; anterior lobe polished, impunctate except for few moderate and many minute punctures laterally, subapically with distinctly impressed line terminated laterally at setigerous puncture posterior to inner margin of eye; posterior lobe with few, scattered, moderate to fine punctures discally and laterally.

Scutellum: Length subequal width, 1.70(1.56–1.82):1.70(1.56–1.82); discally with numerous scattered punctures similar to those of posterior pronotal lobe; apically with punctures finer, more numerous.

Hemelytron: Clavus and corium shining, very finely alutaceous; clavus with median row of punctures and usually a partial row either side; mesocorium with two complete rows of punctures paralleling claval suture, discally with numerous moderate punctures becoming coarser towards base; exocorium similarly punctate on apical half; costa with five to ten setigerous punctures; membranal suture straight, lateral angle little produced; membrane longer than basal width, surpassing apex of abdomen by about half its length.

Pleurae (fig. 102): As described for genus.

Sternites: Alutaceous, impunctate, slightly rugose laterally.

Terminalia: Genital capsule weakly alutaceous, closely punctate in lateral angle, apical margin straight; gonostylus as illustrated (fig. 219).

Length of body: 4.80(4.42–5.20).

Female: Similar to male, measurements averaging slightly larger.

Head: Length-width ratio, 0.88(0.86–0.93):1.37(1.33–1.40); interocular width, 0.93(0.90–0.96). Antennal segments: I, 0.26(0.26–0.26); II, 0.21(0.20–0.23); III, 0.30(0.28–0.31); IV, 0.29(0.26–0.33); V, 0.35(0.33–0.36). Labial segments: I, 0.41(0.40–0.44); II, 0.55(0.53–0.56); III, 0.44(0.41–0.50); IV, 0.32(0.30–0.33).

Pronotum: Length-width ratio, 1.50 (1.43–1.56) : 2.95(2.86–3.00).

Scutellum: Length-width ratio, 1.82(1.75–1.89) : 1.82(1.75–1.89).

Length of body: 4.96(4.85–5.14).

Type data.—The types (USNM) were described by Uhler (1877, p. 378) from the vicinity of Denver City, Colo., and Dallas Co., Tex. The location of the type of Signoret's *Homaloporus pangaeiformis* is unknown to the author, but the species was described from "Mexique." The locality of the type specimen (Wien) of *Aethus ferrugineus* Signoret (1882, p. 40) was also given as "Mexique."

Specimens studied.—18 males, 21 females, 1 third-instar nymph.

United States: *Arizona:* Oak Creek, December. *California:* Laguna Beach, Lone Pine, Los Angeles, Riverdale, San Diego, Santa Cruz, Wilmington; April to August. *Colorado:* Cortez, Cottonwood, Denver, Fort Collins, Palisades, Salida; April to July, October, third instar nymphs in July. *Kansas:* Greeley Co., Thomas Co. *New Mexico:* Estancia, Mesilla Park, Santa Fe Co.; July, August. *Utah:* Brigham, St. George; February, August.

Mexico: *Distrito Federal:* Guadalupe Hidalgo; July. *México:* Amecameca.

Discussion: The type of *Homaloporus pangaeiformis* Signoret has not yet been located, but the author feels no misgivings about assigning the name to synonymy. Considering first Signoret's comparison of this with *congruus*, the more oval and broader form that he ascribes to *pangaeiformis* may be a sexual difference, but in the series of *congruus* at hand there was noticeable variation in robustness of both sexes sufficient to include Signoret's figures (47 and 48) of both species. The descriptive statement that the mesopleuron has no shining space between the evaporatorium and the posterior margin of the segment is not borne out by the figure, which shows that area to have a different surface texture. Another feature that he listed, the evanescent, acute apex of the peritreme, appears to have no specific value in this genus as it occurs on North American material almost as freely as does the abrupt termination. The other differences mentioned are definitely not of specific value here. But returning to Signoret's illustration (fig. 48) of the mesopleuron and metapleuron of *H. pangaeiformis*, one notices that something is amiss as the osteolar

petritreme appears to be located on the mesopleuron—a condition unknown to this or any other family of the Hemiptera.

Discovery of this erroneous detail crystallized the author's suspicions that Signoret worked by comparison with his own illustrations, which appear to have been done without reference to the specimens once the preliminary sketches had been made. This permitted Signoret to misinterpret his own sketch when finishing the drawing. Then, in comparing additional material with his figures he could not help but find differences. Examination of the types of several other cydnids described by Signoret and comparison of them with the illustrations supported this contention.

Aethus ferrugineus Signoret is here placed as a synonym of *congruus* (Uhler) as a result of study of the female type (Wien). The type labeled "Bilimek, Mexico, 1871, Chapultepec," is in good condition, lacking only antennals IV and V on each side, the right middle leg and all or part of the tarsi from the left front, left middle, and right hind legs. Most of the pubescence is present.

That Signoret's species belongs to *Homaloporus* as described by Uhler, Signoret himself, and subsequent authors is beyond doubt. The type does not agree with the original description in having the anterior pronotal margin "faiblement margine," but instead shows a sharply defined, well impressed, subapical groove. The head also possesses a submarginal row of coarse, setigerous punctures giving rise to short, stout pegs and several long cilia; and the osteolar canal lacks a differentiated terminal lobe.

Other discrepancies between the type and the original description are: (1) "lobe median . . . sans points piligeres" is not wholly true; although the cilia are missing, the punctures are quite evident; (2) the lateral pronotal row of setigerous punctures does not number 13 or 14, but actually 18 with a complete set of like number of cilia on the right side and a full set of punctures and nearly a full set of cilia on the left side; (3) costal setigerous punctures are nine on the right side and eight on the left.

With his original description of *H. congruus*, Uhler gave the following interesting notes concerning capture of specimens:

> . . . and a few specimens occurred to me while collecting insects near the foothills of the Rocky Mountains, west of Denver, in August 1875. The summer was a particularly rainy one, and the sudden chilling of the atmosphere by a hailstorm would cause this insect, together with beetles, flies, Hymenoptera, and other Hemiptera, to take refuge under the tufts of grass and roots of Yucca and other flowers and herbs, where they remained secure from the driving elements.

It is interesting to speculate about the development of a complete row of pegs on the submargin of the head on two species (*P. congruus* and *P. subtilius*) at widely separated parts of the geographic range of

the genus. Whether this is just coincidence or reflects the adaptation to conditions found at either end of its geographic range remains to be demonstrated by more detailed biological information about the species concerned.

Pangaeus (*Homaloporus*) *punctilinea*, new species

Diagnosis.—The row of distinct punctures in the subapical impressed line of the pronotum will permit easy recognition of this species within the subgenus.

Description.—Described from three females. Female: Oval, sides subparallel, faintly widened behind midlength.

Head: Length almost two-thirds width, 0.97(0.96–1.00):1.54 (1.51–1.61); interocular width, 1.05(1.03–1.08); anterior outline a somewhat flattened semicircle, clypeus as long as juga and slightly narrowed at apex; surface weakly convex, polished, with numerous minute punctures and several radiating weak rugae on each jugum; submarginal setigerous punctures somewhat variable in arrangement, two or three close-set punctures with two more widely separated ones beyond, or four close-set punctures with one widely separated puncture distally; ocelli very small, separated from eye by a space equalling four to five transverse ocellar diameters; jugum ventrally and maxillary plate (except base) shining, impunctate. Antennal segments: I, 0.30(0.30–0.31); II, 0.33(0.32–0.34); III, 0.35(0.34–0.36); IV, 0.44 (0.43–0.46); V, 0.51(0.49–0.54). Bucculae about half as high as labial II; labium reaching between middle coxae. Labial segments: I, 0.54(0.51–0.56); II, 0.85(0.83–0.90); III, 0.67(0.64–0.70); IV, 0.50(0.50–0.50).

Pronotum: Anterior margin moderately, doubly emarginate; side margins faintly convex on basal half, more strongly so on apical half, with submarginal row of seven to nine setigerous punctures; transverse impression postmedian, obsolete, absent medially, marked by narrow, irregular band of distinct punctures; anterior lobe distinctly punctured in complete, subapical impressed line, with few to many distinct punctures laterally, discally with numerous obsolete, minute punctures; posterior lobe medially with few coarse and numerous minute punctures, laterally with a few coarse punctures.

Scutellum: Length subequal, longer or shorter than width, 1.77 (1.75–1.82):1.80(1.74–1.82); disc polished, discally with numerous large punctures except at base and apex.

Hemelytron: Clavus and corium polished, clavus with one, nearly complete row of distinct punctures; mesocorium with two complete rows of punctures paralleling claval suture, discally with numerous small punctures scattered full length; exocorium with numerous distinct punctures scattered for full length; costa with two setigerous

punctures; membranal suture nearly straight, lateral angle weakly produced; membrane longer than basal width, distinctly surpassing apex of abdomen.

Propleuron: Shining, with few punctures in depression and anteroventral angle; prosternal carinae less than half as high as labial II.

Mesopleuron: Evaporatorium reaching posterior margin for more than half its length; lateral area rugopunctate.

Metapleuron: Evaporatorium with lateral margin straight; lateral area with row of obsolete, broad punctures adjacent to edge of evaporatorium.

Legs: Posterior femora not tuberculate ventrally.

Sternites: Shining, with few punctures and longitudinal rugae laterally.

Length of body: 5.57(5.45–5.78).

TYPE DATA.—Holotype female (USNM 64422), "Brownsville, Texas, Wickham, col. C. F. Baker." Paratypes as follows:

TEXAS: Brownsville, 1929, 1 female (USNM); 25 miles southeast of Harlingen, Sept. 21, 1945, E. Hardy, nest of *Neotoma micropus* BD., 1 female (JAS).

DISCUSSION: The subapical transverse impression of the pronotum, while distinctly punctured, is, nevertheless, complete from one side of the pronotum to the other.

Pangaeus (Homaloporus) rugiceps Horváth

PLATE FIGURES 48, 221

Pangaeus rugifrons Signoret (nec Herrick-Schaeffer, 1839, p. 97, a synonym of *Pangaeus bilineatus*), p. 252, pl. 8, fig. 111, 1882.
Pangaeus rugiceps Horváth, p. 236, 1919.

DIAGNOSIS.—At present, this is the only species in the subgenus with a single submarginal setigerous puncture in front of an eye.

DESCRIPTION.—Male: Oval, widest at or slightly behind midlength.

Head: Length more than two-thirds width, 1.17(1.10–1.26):1.59 (1.52–1.70); interocular width, 0.99(0.95–1.06); anterior outline an elongated semicircle, juga longer than apically narrowed clypeus and nearly or quite contiguous beyond it; juga impunctate, with strong, mostly transverse rugae, submarginally with one setigerous puncture anterior to eye; ocelli moderately large, separated from eye by space somewhat greater than transverse ocellar width; jugum ventrally in large part rugopunctate; maxillary plate polished, impunctate. Antennal segments: I, 0.28(0.26–0.30); II, 0.29(0.26–0.32); III, 0.39 (0.36–0.43); IV, 0.42(0.42–0.44); V, 0.46(0.44–0.49). Bucculae about half as high as labial II, labium reaching between middle coxae. Labial segments: I, 0.52(0.48–0.56); II 0.84(0.80–0.93); III, 0.64 (0.60–0.68); IV, 0.46(0.40–0.50).

Pronotum: Length more than half width, 1.90(1.75–2.02):3.35 (3.06–3.55); anterior margin shallowly, doubly emarginate; lateral margins straight to very slightly sinuate opposite ends of transverse impression, with six setigerous submarginal punctures; transverse impression weak, obsolete at middle, marked by medially interrupted, irregular row of coarse punctures; surface elsewhere impunctate except for prominent punctures laterally on anterior lobe and a few medially on posterior lobe.

Scutellum: Length equal to, longer, or shorter than width, 2.10 (1.92–2.22):2.09(1.89–2.28); surface polished, basal third to fourth impunctate, disc with several widely scattered, coarse punctures and numerous interspersed minute punctures, latter extending to apex.

Hemelytron: Clavus and corium shining, very weakly alutaceous; clavus with a partial row of punctures; mesocorium with two complete rows paralleling claval suture, discally with numerous scattered small punctures becoming more abundant and stronger apically; exocorium with few weak punctures scattered over most of its length; costa with two or three setigerous punctures; membranal suture slightly bisinuate, lateral angle vaguely produced; membrane longer than basal width, distinctly surpassing apex of abdomen.

Propleuron: Vaguely alutaceous, with no distinct punctures; prosternal carinae less than half as high as labial II, sharp.

Mesopleuron: Lateral area finely alutaceous, impunctate.

Metapleuron: Evaporatorium moderately concave laterally; lateral area weakly alutaceous, impunctate.

Legs: Posterior femora not tuberculate ventrally; posterior tibiae not angulate ventrally near base.

Sternites: Shining, vaguely alutaceous, impunctate but with fine longitudinal rugae in spiracular area.

Terminalia: Genital capsule rugopunctate laterally, finely punctured elsewhere, apical margin weakly sinuate medially; gonostylus as illustrated (fig. 221).

Length of body: 6.11(5.60–6.71).

FEMALE: Very similar to male.

Head: Length-width ratio, 1.23(1.10–1.36):1.69(1.56–1.84); interocular width, 1.05(0.96–1.16). Antennals: I, 0.30(0.27–0.33); II, 0.30(0.28–0.33); III, 0.41(0.36–0.46); IV, 0.44(0.40–0.50); V, 0.46 (0.43–0.50). Labials: I, 0.53(0.50–0.60); II, 0.95(0.86–1.03); III, 0.79 (0.63–1.16); IV, 0.56(0.49–0.73).

Pronotum: Length-width ratio, 2.07(1.89–2.34):3.61(3.16–4.11).

Scutellum: Length-width ratio, 2.19(1.82–2.60):2.25(1.95–2.53).

Length of body: 6.53(5.93–7.22).

TYPE DATA.—Signoret misapplied the name *rugifrons* of Herrick-Schaeffer (now shown to be a synonym of *Pangaeus bilineatus* (Say))

to a specimen from "Mexique." Horváth (1919, p. 236) called attention to this error and proposed the new name *Pangaeus rugiceps* for this Mexican specimen, which thus becomes the type of *rugiceps*. The specimen was originally in Signoret's own collection.

SPECIMENS STUDIED.—82 males, 95 females.

MEXICO: *Chiapas:* Escuintla; February. *Colima:* Armería, Colima, Manzanito; July. *Guerrero:* Balsas, Iguala; September. *Jalisco:* Volcán de Colima, Villa Corona. *Morelos:* Alpuyeca; June. *Nuevo León:* Monterrey (1,700 feet); June. *Oaxaca:* Tuxtepec. *San Luis Potosí:* El Salto; June. *Sinaloa:* Mazatlán; August. *Sonora:* Minas Nuevas; August.

GUATEMALA: *Chiquimula:* Chiquimula (1,000 feet), Sacapulas (4,500 feet); July, August. *Zacapa:* Zacapa (600 feet); July.

EXTRALIMITAL SPECIMENS: UNITED STATES: *Louisiana:* "ex airplane" from Mexico.

DISCUSSION.—Signoret's erroneous application of Herrick-Schaeffer's name is quite understandable, especially if he had only very limited material of *bilineatus* and thus was not aware that individuals of *bilineatus* did show rugae on the head. The figure of *rugifrons*, especially in rugae and outline of the head, is very suggestive of the present species. The type locality, however, precludes the employment of that name for this species.

Pangaeus (Homaloporus) setosus, new species

PLATE FIGURES 49, 222

DIAGNOSIS.—This species may be recognized within the subgenus by the presence of numerous tubercles on the ventral surface of the posterior femur (as in fig. 154) in combination with a partial, submarginal row of setigerous punctures on the anterior half or more of the head (fig. 49).

DESCRIPTION.—MALE: Oval, somewhat parallel-sided.

Head: Length almost two-thirds width, 1.18(1.06–1.26):1.84(1.71–1.95); interocular width, 1.17(1.06–1.26); anterior outline elongate, weakly truncate semicircle, juga longer than and nearly or quite contiguous beyond apex of clypeus; surface shining, with numerous minute punctures and partial, radiating rugae; jugum depressed discally, with four or five setigerous punctures submarginally in front of eye and on apical half a partial row of close-set setigerous punctures giving rise to a row of short, stout pegs (fig. 49); ocelli small, situated behind line connecting hind margins of eyes, removed from eye by more than two times a transverse ocellar width; jugum ventrally and maxillary plate shining, impunctate. Antennal segments: I, 0.40 (0.38–0.46); II, 0.52(0.50–0.60); III, 0.55(0.46–0.66); IV, 0.69(0.60–0.76); V, 0.75(0.70–0.83). Bucculae about as high as labial II, obliquely terminated posteriorly; labium reaching between middle

coxae. Labial segments: I, 0.60(0.57–0.60); II, 1.04(1.01–1.10); III, 0.94(0.90–1.01); IV, 0.54(0.50–0.56).

Pronotum: Length more than half width, 2.14(2.02–2.26):4.03 (3.82–4.26); anterior margin moderately, simply emarginate; lateral margin entire, broadly and shallowly curved, with nine or ten setigerous punctures submarginally; transverse impression obsolete to absent, marked by very irregular row of scattered punctures; anterior lobe impunctate except for lateral patch of about one dozen coarse punctures with minute punctures interspersed; posterior lobe with few moderate punctures medially and laterally.

Scutellum: Longer than wide, 2.66(2.53–2.79):2.53(2.34–2.73); disc polished, with numerous coarse, usually foveate punctures becoming finer toward apex.

Hemelytron: Clavus and corium shining; clavus with one row of punctures; mesocorial surface slightly uneven, punctures in one row paralleling claval suture and closely set on basal half, apically the punctures are much finer and sparser; exocorium obsoletely to distinctly punctate for full length; costa with two to four setigerous punctures; membranal suture straight, lateral angle distinctly produced; membrane longer than basal width, surpassing apex of abdomen.

Propleuron: Shining, punctate ventrally in depression and anterior to acetabulum; prosternal carinae less than half as high as labial II.

Mesopleuron and metapleuron: Similar to figure 106, but peritreme abruptly terminated apically.

Legs: Posterior femur with numerous small tubercles on ventral face; posteroventral margin of hind tibia with a finely crenulate basal emargination and a strong angulation distad of it (as in fig. 153).

Sternites: Shining, impunctate except in trichobothrial area.

Terminalia: Genital capsule with broad, shallow emargination medially; gonostylus as illustrated (fig. 222).

Length of body: 7.89(7.38–8.38).

Female: Similar to male, but without modification of posterior tibia.

Head: Length-width ratio, 1.18(1.13–1.23):1.87(1.75–2.00); interocular width, 1.16(1.11–1.23). Antennal segments: I, 0.41(0.40–0.43); II, 0.54(0.50–0.60); III, 0.55(0.50–0.60); IV, 0.70(0.70–0.72); V, 0.76(0.70–0.79). Labial segments: I, 0.57(0.53–0.64); II, 1.10 (1.03–1.16); III, 0.94(0.90–1.00); IV, 0.53(0.49–0.56).

Pronotum: Length-width ratio, 2.31(2.12–2.60):3.97(3.71–4.29).

Scutellum: Length-width ratio, 2.72(2.53–2.93):2.40(2.28–2.53).

Length of body: 7.79(7.18–8.31).

Type data.—Holotype male and allotype female (both MCZ), "Oracle, Ariz., 11–iii–1919, 4500 ft." Paratypes as follows:

United States: *Arizona:* Same data as types, 3 males, 8 females (MCZ, RCF); same locality as types, Mar. 7, "2 males labeled *Pangaeus bilineatus* Uhl. det. O. H.[eidemann]" (USNM). Dry Canyon Sands Ranch, southeast end of Whetstone Mts., Cochise Co., Aug. 10, 1952, H. B. Leech and J. W. Green, 1 male (CalAc). Mt. Lemon Road, 6,000 feet, Santa Catalina Mts., Dec. 27, 1937, E. C. Van Dyke, 2 males, 1 female (CalAc). Benson, June 7, 1930, G. Linsley, 1 male (CalAc). Santa Rita Mts., 5,000 to 8,000 feet, July, F. H. Snow, 1 male (KU). Catalina Springs, Apr. 27, 1 female (USNM). Baboquivari Mts., July 24, 1941, R. H. Beamer, 1 female (KU); Nov. 8, 1936, E. D. Ball, 1 female (USNM). Paradise, July 22, 1914, 1 male (USNM). Douglas, W. W. Jones, 1 female (USNM). *Texas:* Presidio Co., July 16, 1927, R. H. Beamer, 2 males, 2 females (KU). El Paso, July 18, 1932, 1 male (RLU). Chisos Mts., Brewster Co., July 16, 1921, C. D. Duncan, 1 female (CalAc). Big Bend Park, Chisos Mts., July 5, 1942, H. A. Scullen, 1 male (USNM). Marathon, C. M. Hamilton, 1 male (USNM). Davis Mts., June 26, 1946, E. C. VanDyke, 1 female (CalAc). Valentine, July 13, 1927, P. A. Readio, 2 females (KU). Guadalupe Pass, Hudspeth Co., July 28, 1950, R. F. Smith, 1 female (AmM). Basin, Big Bend National Park, Brewster Co., July 14, 1950, R. F. Smith, 1 female (AmM).

Mexico: *Chihuahua:* Cañon de Prieto, near Primavera, July 2, 1947, 6,500 to 6,800 feet, D. Rockefeller Exp., Michener. *San Luis Potosí:* El Salto, June 19, 1953, Univ. Kansas Mexican Expedition, 1 male (KU).

Discussion.—This species and the next comprise a pair of forms well-separated from the other species of the subgenus by several characters: (1) the coarse crenulations on the posterior margin of the mesopleuron; (2) the very deeply concave side margin of the metapleural evaporatorium which permits the lateral area to reach almost or quite to the apex of the peritreme; (3) the convex ventral surface of the posterior femur with the numerous small tubercles on the distal half; and (4) the peculiar shape of the hind tibia of the male (fig. 153), the posteroventral margin of which shows a finely crenulate emargination basally and a strong angulation just beyond. The two forms are very close and when more material from northern Mexico is studied it may be found that they represent two forms of a single species. At present, however, they appear separable on the basis of the key character pertaining to the vestiture of the head and the generally separate ranges.

How these two, strongly marked species could remain so long without being described is difficult to explain. This condition reflects the uncertainty that has existed pertaining to the limits of species within the group and leading to many misidentifications.

Pangaeus (Homaloporus) tuberculipes, new species

Plate figures 153, 154, 223

Diagnosis.—The presence of numerous small tubercles on the ventral face of the posterior femur (fig. 154) coupled with the lack of a submarginal row of short stout submarginal pegs on the anterior

half of the head will separate this species from all others within the subgenus.

Description.—Male: Oval, somewhat parallel-sided.

Head: Length two-thirds width, 1.22(1.13–1.31):1.80(1.71–1.96); interocular width, 1.20(1.10–1.26); anterior outline a full semicircle, juga longer than and nearly or quite contiguous anterior to clypeus; surface shining, with numerous distinct, radiating rugae; jugum depressed medially with four to six coarse, setigerous punctures submarginally, without short, stout pegs; ocelli small, situated well behind line connecting posterior margins of eyes, removed from eyes by about three times a transverse ocellar width; jugum ventrally shining, impunctate; maxillary plate impunctate, alutaceous on basal half. Antennal segments: I, 0.39(0.33–0.43); II, 0.46(0.43–0.53); III, 0.52(0.46–0.56); IV, 0.65(0.60–0.70); V, 0.70(0.69–0.73). Bucculae as high as labial II, obliquely terminated posteriorly; labium reaching between middle coxae. Labial segments: I, 0.55(0.53–0.57); II, 1.00(0.88–1.07); III, 0.83(0.71–0.93); IV, 0.52(0.46–0.58).

Pronotum: Length more than half width, 2.22(2.08–2.37):3.98(3.78–4.16); anterior margin moderately, doubly emarginate; lateral margin entire, broadly and shallowly curved, with ten submarginal setigerous punctures; transverse impression obsolete to absent, marked by very irregular row of scattered punctures; anterior lobe impunctate except for lateral patch of about one dozen coarse punctures with minute punctures interspersed; posterior lobe with few moderate punctures medially and laterally.

Scutellum: Length greater than width, 2.67(2.47–2.86):2.40(2.27–2.58); disc polished, with a number of irregularly scattered large punctures.

Hemelytron: Clavus and corium shining; clavus with one row of punctures; mesocorial surface slightly uneven, punctures in one row paralleling claval suture and closely set on basal half, apically the punctures are much finer and sparser; exocorium obsoletely to distinctly punctate for full length; costa with two to five setigerous punctures; membranal suture straight, lateral angle distinctly produced; membrane longer than basal width, distinctly surpassing apex of abdomen.

Propleuron: Shining, punctate ventrally in depression and anterior to acetabulum; prosternal carinae much less than half the height of labial II.

Mesopleuron and metapleuron: Similar to figure 106, but peritreme abruptly terminated apically.

Legs: Posterior femur with numerous small tubercles on ventral face; posteroventral margin of hind tibia with a finely crenulate basal emargination and a strong angulation distad of it (fig. 153).

Sternites: Shining, impunctate except in spiracular area.

Terminalia: Genital capsule distinctly punctate except for broad middle line, apical margin broadly, shallowly emarginate medially; gonostylus as illustrated (fig. 223).

Length of body: 7.83(7.50–8.25).

FEMALE: Similar to male, but without modification of posterior tibia.

Head: Length-width ratio, 1.24(1.20–1.30):1.87(1.78–1.98); interocular width, 1.25(1.20–1.30). Antennal segments: I, 0.37(0.32–0.40); II, 0.49(0.43–0.60); III, 0.53(0.46–0.60); IV, 0.69(0.60–0.80); V, 0.74(0.70–0.80). Labial segments: I, 0.53(0.50–0.56); II, 1.03(0.96–1.18); III, 0.82(0.76–0.93); IV, 0.53(0.50–0.57).

Pronotum: Length-width ratio, 2.23(2.08–2.42):4.07(3.76–4.43).

Scutellum: Length-width ratio, 2.77(2.61–2.97):2.44(2.34–2.66).

Length of body: 7.74(7.20–8.52).

TYPE DATA.—Holotype male and allotype female (both CalAc), 5 miles north of Tizayuca, Hidalgo, Mexico, Nov. 13, 1946, E. S. Ross. Paratypes as follows:

MEXICO: *Hidalgo:* Same data as types, 5 males, 8 females (CalAc, USNM, RCF). "Guerrero Mills," W. M. Mann, 1 male, 1 female (MCZ). *Distrito Federal:* "15 mi. S. of El Guarda," Nov. 14, 1946, E. S. Ross, 1 male, 2 females (CalAc); July 10, 1 female (Mex). Peñón del Marquis, March 27, Wheeler, 1 male, 4 females (MCZ). Pedregal, June 29, 1932, 1 female (RLU). Lomas de Chapultepec, July 14, 1932, 1 female (RLU). Peñón, Viejo, June 21, 1932, 1 female (RLU). Pedregal San Angel, Aug. 27, 1939, C. Bolívar, 1 female (Pel). *State unknown:* Minatitlán, Feb. 1, 1892, H. Osborn, 1 male labeled *Pangaeus rugifrons* H-S., *Pangaeus confusus* Sign., and *Pangaeus discrepans* Uhl. (USNM).

UNITED STATES: *Texas:* Devil's River, June 6, 1907, Bishop and Pratt, at light, 1 female (USNM). Colorado City, July 17, 1927, L. A. Stephenson, 1 female (KU).

DISCUSSION.—This form is discussed with the preceding species.

Subgenus *Pangaeus* (*Pangaeus*) Stål

Pangaeus Stål, 1862, p. 95.

DIAGNOSIS.—The key character concerning the extensiveness of the mesopleural evaporatorium is the most reliable feature for separating this subgenus from subgenus *Homaloporus*.

DESCRIPTION.—The generic description as modified by the notes in the generic discussion will furnish sufficient description for this subgenus.

TYPE OF SUBGENUS.—*Aethus margo* Dallas, subsequent designation by Van Duzee (1914, p. 378); this name is a synonym of *Cydnus aethiops* Fabricius, which is treated in the present paper as a member of the genus *Pangaeus*. For explanation of this synonymy see the discussion under *Pangaeus aethiops*.

DISTRIBUTION.—The range of the nominal subgenus occupies the southern part of the range of the genus, overlapping the range of subgenus *Homaloporus* to the north for a short distance in Guatemala and southern Mexico.

DISCUSSION.—The problems encountered in this subgenus were somewhat different from those found in most other parts of the family. The males of all forms were rather easily separated with the aid of secondary sexual characters, but not all the females have, as yet, proven decipherable. Therefore, as indicated in the key to species, females of certain species cannot yet be properly separated from their congeners. This situation results from the great variability of external features in the females which either prevent establishment of reasonable limits to the species as indicated by the males, or results in the separation of a disproportionate and unbelievable number of forms. Therefore, until later studies of the internal genitalia are made, the author deems it best to treat only such females as lend themselves to ready association with males through possession of some outstanding common character.

Key to the species of *Pangaeus* (*Pangaeus*)

1. Posterior tibia with spines of posteroventral margin conspicuously longer, thinner, and sharper than those on dorsal margin (fig. 159); head transversely convex, basal half or more of jugum with several distinct, coarse, transverse rugae 2
   Posterior tibiae with spines equally developed on all margins; head flattened, jugum with broad, shallow, longitudinal impression medially 5
2. Jugum with a complete, submarginal row of setigerous punctures which give rise to a series of pegs and hairs 3
   Jugum without a complete row of submarginal setigerous punctures, those which are present give rise to hairs but not pegs 4
3. Mesocorium with numerous moderate but distinct punctures over entire surface . . . . **semibrunneus,** new species (p. 502)
   Mesocorium virtually impunctate . . . . . . **subtilius** (Signoret) (p. 507)
4. Costa with ten or more setigerous punctures; tibiae and femora concolorous. **pluripunctatus,** new species (p. 479)
   Costa with five or less setigerous punctures; basal third or more of hind tibia and apex of femur yellow, distinctly lighter than greater part of femur . . . . **xanthopus** Signoret (p. 481)
5. Jugum with four setigerous punctures submarginally (fig. 47) 6
   Jugum with one or two submarginal setigerous punctures 9
6. Anterior pronotal lobe laterally with broad patch of numerous distinct, moderately coarse punctures 7
   Anterior pronotal lobe impunctate or with less than half dozen distinct punctures 8
7. Pronotum with subapical impressed line and midline of anterior lobe distinctly punctate (fig. 74) . . . . . . **punctinotum,** new species (p. 495)
   Pronotum with subapical impressed line and midline of anterior lobe impunctate; calli posteriorly with numerous small rugae (fig. 73). **rugonotum,** new species (p. 501)

8. Costa with one setigerous puncture; transverse impression of pronotum sharply impressed across full width . . . . **rubrifemur** (Walker) (p. 499)
   Costa with three or four setigerous punctures; transverse impression of pronotum weakly impressed or interrupted at middle.
   rufobrunneus Jensen-Haarup (p. 498)
9. Males (abdomen ending in single, cuplike genital capsule). 10
   Females (abdomen ending in several pairs of triangular plates) 18
10. Posterior tibia ventrally with distinct, subbasal angulation, with one to three spines on posteroventral margin before apex (figs. 155, 156) . . 11
   Posterior tibia ventrally without subbasal angulation, posteroventral margin with four or more spines before apex (figs. 157, 158) 13
11. Apex of genital capsule with a broad, deep, U-shaped emargination (fig. 177).
   aethiops (Fabricius) (p. 504)
   Apex of genital capsule not emarginate, sometimes gently sinuate 12
12. Costa with two setigerous punctures; larger, length of body 5.84–6.60.
   impressus, new species (p. 486)
   Costa with one setigerous puncture; smaller, length of body 4.21–5.56.
   docilis (Walker) (p. 484)
13. Costa with two (rarely three) setigerous punctures 14
   Costa with one setigerous puncture 16
14. Corium distinctly alutaceous (at 15 magnifications); larger, length of body 5.8–7.1 . . . . **neogeus,** new species (p. 491)
   Corium polished, not alutaceous (at 30 magnifications); smaller, length of body 5.0–5.3 15
15. Jugum with two submarginal setigerous punctures, one immediately anterior to eye and one near apical third . . **bisetosus,** new species (p. 483)
   Jugum with one submarginal setigerous puncture just anterior to eye.
   moestus (Stål) (p. 489)
16. Posterior tibia with four strong spines on posteroventral margin before apex.
   piceatus Stål (p. 492)
   Posterior femur with more than four spines on posteroventral margin before apex. 17
17. Corium polished, with two complete (or nearly complete) rows of mesocorial punctures paralleling claval suture; smaller, length of body 4.8–5.7.
   quinquespinosus, new species (p. 497)
   Corium distinctly alutaceous, with one complete row of mesocorial punctures paralleling claval suture; larger, length of body more than 7.
   laevigatus Signoret (p. 487)
18. Ocelli large, separated from eye by a space not greater than transverse ocellar width . . . . **aethiops** (Fabricius) (p. 504)
   Ocelli smaller, separated from eyes by space not less than 1½ times transverse ocellar diameter (to date the author has been unable to prepare a key that will satisfactorily separate females which run here).

***Pangaeus (Pangaeus) pluripunctatus*, new species**

Plate figure 224

Pangoeus [!] *aethiops* Signoret (nec Fabricius), 1882, p. 245, pl. 8, fig. 104.

Diagnosis.—The abundant setigerous punctures on the costa (10 or more) set this species apart from all others in the subgenus.

Description.—From one male and one female.

Male: Broadly oval, basal halves of costa straight, subparallel.

Head: Length about two-thirds width, 1.10:1.51; interocular width, 1.00; anterior outline a slightly prolonged semicircle, clypeus as long as juga and narrowed at apex; surface convex, shining, with scattered minute punctures and numerous distinct, coarse, radiating rugae; jugum with four setigerous punctures submarginally; ocelli moderately large, separated from eye by about twice transverse ocellar width; jugum ventrally and maxillary plate shining, impunctate. Antennal segments: I, 0.32; II, 0.20; III, 0.35; IV, 0.30; V, 0.36. Bucculae lower than labial II, evanescent posteriorly; labium reaching between middle coxae. Labial segments: I, 0.50; II, 0.88; III, 0.69; IV, 0.35.

Pronotum: Length little more than half width, 1.82:3.51; anterior margin shallowly, singly emarginate; lateral margin entire, posterior part hidden from dorsal view by somewhat swollen umbones, with 16 setigerous punctures submarginally; transverse impression submedian, weak, marked by medially interrupted, regular row of large punctures; anterior lobe without large punctures, midline narrowly depressed between calli; posterior lobe with three discal patches of a few punctures each.

Scutellum: Length about four-fifths width, 1.82:2.21; disc polished, with irregularly scattered, large punctures except at base and apex.

Hemelytron: Clavus and corium finely alutaceous; clavus with one row of punctures; mesocorial punctures obsolete except those in impressed row and basal half of second row paralleling claval suture; exocorium without distinct punctures; costa with 10 or 11 setigerous punctures; membranal suture virtually straight, lateral angle faintly prolonged; membrane longer than basal width, surpassing apex of abdomen.

Propleuron: Faintly alutaceous, impunctate; prosternal carinae less than half as high as labial II.

Mesopleuron: Lateral area impunctate.

Metapleuron: Lateral margin of evaporatorium weakly concave; lateral area impunctate.

Legs: Tibiae and femora unicolorous; hind tibia curved, spines of posteroventral margin longer, thinner and more tapering than those of dorsal margins (as in fig. 159).

Sternites: Shining, impunctate except for a single row of setigerous punctures across II and a double row across III.

Terminalia: Genital capsule with very sparse, fine punctures becoming slightly more numerous laterally, apical margin with broad, very shallow punctures mesally; gonostylus as illustrated (fig. 224).

Length of body: 5.50.

Female: Similar to male except that the head is without the minute punctures dorsally.

Head: Length-width ratio, 1.04:1.50; interocular width, 1.00. An-

tennal segments: I, 0.30; II, 0.23; III, 0.36; IV and V missing. Labial segments: I, 0.60; II, 0.80; III, 0.66; IV, 0.43.

Pronotum: Length-width ratio, 1.80:3.70.

Scutellum: Length-width ratio, 2.10:2.23.

Length of body: 6.00.

TYPE DATA.—The holotype male (USNM 64420), originally in the Uhler collection, is labeled simply "Montevideo," undoubtedly referring to the capital of Uruguay. The allotype female is from the Berg collection and bears the label "Uruguay"; this specimen is being returned to the Universidad Nacional de La Plata, where the Berg collection is housed.

DISCUSSION.—This is the species treated as *aethiops* by Signoret. His description and illustration of the ten setigerous punctures on the costa prevent such assignment.

Pangaeus (Pangaeus) xanthopus Signoret

PLATE FIGURES 159, 236*b*

Pangoeus [!] *xanthopus* Signoret, 1882, p. 254.
Pangaeus aethiops Lethierry and Severin, 1893, p. 69.
Pangaeus uhleri xanthopus Lethierry and Severin, 1893, p. 70.

DĪAGNOSIS.—Either the bicolored legs (especially posterior pair) in which the apex of the femur and the basal third or more of the tibia are contrastingly yellow, or the longer, more slender spines of the posterior margin of the hind tibia (as in fig. 159) coupled with the few (not over five) setigerous punctures on the costa will separate this species from all others in the genus.

DESCRIPTION.—MALE: Broadly oval, costae mostly arcuate.

Head: Length about two-thirds width, 1.05(0.93–1.12):1.53(1.36–1.70); interocular width, 0.91(0.83–1.00); anterior outline a slightly prolonged semicircle, juga as long as or slightly longer than clypeus and greatly narrowing or contiguous beyond it; surface convex, impunctate, with number of weak to distinct radiating rugae; jugum with one submarginal setigerous puncture anterior to eye; ocelli large, situated on line connecting hind margins of eyes, separated from eye by space less than transverse ocellar width; jugum ventrally and maxillary plate, except basal margin, polished, impunctate. Antennal segments: I, 0.28(0.26–0.33); II, 0.22(0.19–0.26); III, 0.38(0.33–0.43); IV, 0.37(0.33–0.43); V, 0.40 (0.36–0.46). Bucculae not as high as labial II, evanescent posteriorly; labium reaching nearly or quite to bases of middle coxae. Labial segments: I, 0.41(0.36–0.43); II, 0.59(0.53–0.64); III, 0.52(0.50–0.55); IV, 0.41(0.38–0.46).

Pronotum: Length about half width, 1.62(1.36–1.90):3.24(2.79–3.64); anterior margin shallowly, doubly emarginate; lateral margin entire, very weakly arcuate on basal half, with submarginal row of

seven to ten setigerous punctures; transverse impression weak to obsolete, marked by medially interrupted, somewhat irregular row of large punctures; anterior lobe with few scattered punctures behind subapical line, along midline and laterally; posterior lobe with punctation dense medially and becoming sparser laterally.

Scutellum: Length less than width, 1.97(1.69–2.21):2.04(1.75–2.28); disc weakly alutaceous, with numerous punctures except at base.

Hemelytron: Clavus and corium finely alutaceous; clavus with double row of small punctures; mesocorium with two more or less equally developed rows of distinct punctures paralleling claval suture, rest of area obsoletely punctured except in basal third and in outer apical angle; exocorium with punctures scattered for full length; costa with two to five setigerous punctures; membranal suture nearly straight, lateral angle slightly prolonged; membrane longer than basal width, distinctly surpassing apex of abdomen.

Propleuron: Alutaceous, punctate in depression and anterior to acetabulum; prosternal carinae less than half as high as labial II.

Mesopleuron: Lateral area impunctate.

Metapleuron: Lateral margin of evaporatorium weakly concave; lateral area impunctate.

Legs: Posterior tibia with spines of posteroventral margin longer, more slender and tapering than those of dorsal margins (fig. 159); tibiae bicolored, basal half or more (especially of posterior pair) pale yellow, contrasting distinctly with the mostly reddish brown femora.

Sternites: Alutaceous; impunctate.

Terminalia: Genital capsule alutaceous, very sparsely, finely punctured medially, apical margin entire, straight in posterior view; gonostylus as illustrated (fig. 236b).

Length of body: 5.54(4.74–6.18).

Type data.—Signoret's *xanthopus* was based on a specimen from "Bresil" in the "Berlin Museum."

Specimens studied:

Bolivia: Province of Sara, Santa Cruz de la Sierra (450 meters), Tiguipa; April, November, December.

Brazil: Bahia, Ceara, Joazeiro, Matto Grosso, Parnaguá, Serrinha (Paraná); October to December.

Paraguay: Horqueta, Villarrica; November to February.

Argentina: Buenos Aires, Marull, Patquia, Tucumán; January.

Discussion.—This is the only member of the genus that fits Signoret's description "les pattes d'un jaune pale, avec les poils et epines noirs." The type repository as given by Signoret was "Berlin Museum" and undoubtedly referred to what is now the Zoologisches Museum der Humboldt-Universität, in East Berlin. However, personal examination of that collection and the one at the Deutsches

Entomologisches Institut, also in East Berlin, did not locate the specimen.

Within the subgenus, *xanthopus*, *pluripunctatus*, *semibrunneus*, and *subtilius* stand out on the basis of the modification of the spines of the posterior tibiae and the convex, more or less rugose head surface. Both of these characters appear in the genus *Cyrtomenus*, which these four species superficially resemble quite closely due to their more convex dorsum. Other students may prefer to transfer these four species to *Cyrtomenus*, a step which could be easily accomplished by rearranging the key to genera so that the character of the spines of the hind tibiae comes before that of the subapical impression of the pronotum. The present author, however, prefers to consider the subapical impression of the pronotum a better phylogenetic indicator and to leave these forms as they have been treated for many years. The conclusion to keep these forms in *Pangaeus* is admittedly conservative and currently tentative until investigations of the internal genitalia of the females are made.

Pangaeus (*Pangaeus*) *bisetosus*, new species

Plate figure 225

Diagnosis.—The presence of two submarginal setigerous punctures on a jugum (one next to eye, one at apical third) will separate this species from all others in the subgenus.

Description.—Based on one male. Male: Oval, widest near midlength.

Head: Length more than four-fifths width, 1.19:1.30; interocular width, 0.75; anterior outline a full semicircle, clypeus as long as juga, strongly narrowed apically; surface shining, impunctate; jugum with two submarginal setigerous punctures, one immediately anterior to eye and one at apical third; ocelli moderate, separated from eye by space equal to twice transverse ocellar width; jugum ventrally and maxillary plate, except basal margin, polished, impunctate. Antennal segments: I, 0.23; II, 0.26; III, 0.33; IV, 0.38; V, 0.50. Bucculae about half as high as labial II; labium reaching between middle coxae. Labial segments: I, 0.46; II, 0.72; III, 0.63; IV, 0.34.

Pronotum: Length more than half width, 1.42:2.60; anterior margin shallowly emarginate; lateral margin curved from near base, with five setigerous punctures submarginally; transverse impression postmedian, impressed for full width, marked by row of punctures; anterior lobe impunctate except for not more than five punctures laterally; posterior lobe with 12 to 15 punctures medially.

Scutellum: Length less than width, 1.49:1.62; disc shining, with not more than five large punctures.

Hemelytron: Clavus and corium shining; clavus with several punctures in one longitudinal row; mesocorium finely or obsoletely punctate except for one complete and basal third of second row paralleling claval suture; exocorium obsoletely punctured; costa with two setigerous punctures; membranal suture straight, lateral angle not produced; membrane longer than basal width, surpassing apex of abdomen.

Propleuron: Faintly alutaceous, punctate only in depression; prosternal carinae less than half as high as labial II.

Mesopleuron: Lateral area impunctate.

Metapleuron: Lateral margin of evaporatorium straight; lateral area impunctate.

Legs: Not specially modified, hind tibia with four spines on posteroventral margin.

Sternites: Polished, impunctate.

Terminalia: Genital capsule with few scattered, fine punctures; apical margin very broadly and very shallowly U-shaped; gonostylus as illustrated (fig. 225).

Length of body: 5.00.

Type data.—Holotype male (Cap), "Venezuela Exp., Culebra N. Duida Terr., Amazonas, April 7–16, J. Maldonado Capriles Coll."

Discussion.—The name *bisetosus* is given in obvious reference to the two setigerous punctures on each jugum.

***Pangaeus* (*Pangaeus*) *docilis* (Walker)**

Plate figures 156, 226

Aethus docilis Walker, 1867, p. 154.
Pangoeus [!] *dallasi* Signoret, 1882, p. 263, pl. 9, fig. 121.
Pangaeus dallasi Lethierry and Severin, 1893, p. 69.
Pangaeus docilis Distant, 1899, p. 221.

Diagnosis.—The male of *docilis* may be separated from all other species in the genus by the subbasal angulation on the posteroventral margin of the hind tibia and the single setigerous puncture on the costa.

Description.—Male: Oval, widest near midlength.

Head: Length two-thirds width, 0.86(0.81–0.90):1.28(1.13–1.36); interocular width, 0.78(0.72–0.83); anterior outline semicircular, clypeus as long as juga and strongly narrowed apically; surface shining, impunctate, with weak rugae; jugum with one submarginal setigerous puncture anterior to eye; ocelli moderate, separated from eye by space more than twice transverse ocellar width; jugum ventrally and maxillary plate, except basal margin, polished, impunctate. Antennal segments: I, 0.24(0.21–0.26); II, 0.24(0.20–0.26); III, 0.36(0.30–0.43); IV, 0.46(0.37–0.53); V, 0.55(0.48–0.60). Bucculae nearly as high as labial II; labium reaching between middle coxae. Labial segments:

I, 0.44(0.40–0.46); II, 0.74(0.66–0.80); III, 0.58(0.53–0.65); IV, 0.35(0.30–0.40).

Pronotum: Length little more than half width, 1.47(1.19–1.69):2.71(2.26–2.93); anterior margin shallowly, doubly emarginate; lateral margin straight on basal half, with five setigerous punctures submarginally; transverse impression slightly postmedian, sharply impressed across full width, marked by medially interrupted regular row of close-set punctures; anterior lobe impunctate except for few punctures medially.

Scutellum: Length equal to width, 1.60(1.36–1.75):1.60(1.36–1.75); disc shining, with few to numerous scattered punctures.

Hemelytron: Clavus and corium alutaceous; clavus with one row of punctures; corium not distinctly punctate except along one complete and usually basal part of second row paralleling claval suture; costa with one setigerous puncture; membranal suture straight, lateral angle not produced; membrane longer than basal width, surpassing apex of abdomen.

Propleuron: Shining, punctate in depression and anterior to acetabulum; prosternal carinae less than half as high as labial II.

Mesopleuron: Lateral area with few small punctures.

Metapleuron: Lateral margin of evaporatorium concave; lateral area impunctate.

Legs: Posterior tibia with subbasal angulation and two subapical spines on posteroventral margin (fig. 156).

Sternites: Alutaceous, impunctate.

Terminalia: Genital capsule finely alutaceous, with few scattered punctures, apical margin faintly sinuate either side of apex; gonostylus as illustrated (fig. 226).

Length of body: 5.13(4.21–5.56).

FEMALE: Not yet properly associated with male.

TYPE DATA.—The type female (BrM) was stated by Walker to have come from Rio de Janeiro, Brazil. Signoret described *dallasi* from "Bresil, Guyane." His Brazilian specimen (Wien) has a red label bearing the word "Type."

SPECIMENS STUDIED.—31 males.

GUATEMALA: *Alta Verapaz:* Trece Aguas.

PANAMA: Bugaba, Chilibrillo Caves; May to October.

CANAL ZONE: Barro Colorado Island, Cano Saddle (Gatún Lake), Mt. Hope, Paraíso, Summit; February, July to September.

COLOMBIA: Río Daguta.

VENEZUELA: Cabima, Mt. Marachuaca; May.

BRAZIL: Amazonas, Chapada, Corumba, Macura, west border of Matto Grosso, Nova Teutonia, Taperina; May, September, October.

ECUADOR: Balzapamba.

PERU: Callanga, Department of Junín, Marcapata; November.

Discussion.—The type specimen of *dallasi* was available for study. It is a male that shows well the subbasal angulation on the posterior tibia. In describing the species, Signoret indicated that he thought it might be identical with *docilis*. Other authors, including Distant (loc. cit.), who attempted to place Walker's species, agree that the two are one and the same. In fact, the type bears the label "*docilis* Walk.," in an unknown script. Since the type of *docilis* is a female, as was reported to the author by Dr. China, no better placement can be made at this time.

The Panamanian specimens from the Chilibrillo Caves bore the notation "In cave earth."

Pangaeus (*Pangaeus*) *impressus*, new species

Plate figure 227

Diagnosis.—The male of this new species may be recognized within the subgenus by the combination of a distinct subbasal angulation posteroventrally on the hind tibia, two setigerous punctures on the costa and the lack of an emargination on the apex of the genital capsule.

Description.—Based on two males, one broken. Male: Oval; widest behind midlength.

Head: Length two-thirds width, 1.00(0.93–1.07):1.56(1.53–1.60,) interocular width, 0.94(0.92–0.96); anterior outline nearly or quite a full semicircle, clypeus as long as juga, distinctly narrowed apically; surface shining, impunctate; jugum depressed medially, with one submarginal puncture adjacent to eye; ocelli moderate, separated from eye by space almost twice transverse ocellar width; jugum ventrally and maxillary plate, except basally, polished, impunctate. Antennal segments: I, 0.26(0.26–0.26); II, 0.33(0.33–0.33); III, 0.45(0.44–0.46); IV, 0.56(??–0.56); V, 0.62(??–0.62). Bucculae little more than half as high as labial II; labium reaching between middle coxae. Labial segments (missing from smaller specimen): I, 0.46: II, 0.74: III, 0.73: IV, 0.46.

Pronotum: Length more than half width, 1.84(1.71–1.97):3.43 (323-3.64); anterior margin shallowly, doubly emarginate; lateral margin straight on basal half, with five setigerous punctures submarginally; transverse impression median, impressed across full width, marked by medially interrupted, regular row of very close-set punctures; lobes impunctate except for few weak punctures laterally on anterior lobe and several distinct ones on middle of posterior lobe.

Scutellum: Length little less than width, 2.08(1.95–2.21):2.15 (2.02–2.28); disc shining, with few to several scattered punctures.

Hemelytron: Clavus and corium alutaceous; clavus with one row of punctures; mesocorium with one complete and basal part of second

row of punctures paralleling claval suture, elsewhere impunctate or obsoletely punctate; exocorium without distinct punctures; costa with one setigerous puncture; membranal suture virtually straight; membrane longer than basal width, surpassing apex of abdomen.

Propleuron: Faintly alutaceous, with distinct punctures only in depression; prosternal carinae less than half as high as labial II.

Mesopleuron: Lateral area impunctate.

Metapleuron: Lateral margin of evaporatorium straight; lateral area impunctate.

Legs: Posterior tibia with distinct, subbasal angulation on posteroventral margin which also bears only two subapical spines.

Sternites: Finely alutaceous, impunctate.

Terminalia: Genital capsule finely alutaceous, punctate laterally; apical margin slightly convex at middle, gonostylus as illustrated (fig. 227).

Length of body: 6.22(5.84–6.60).

Type data.—Holotype male (USNM 64421), from "Above Tepic, Mexico, Mar. 23, W. M. Mann collector." Paratype, 1 male (RLU) from Tejupilco, Mexico, June 18, 1933, H. E. Hinton and R. L. Usinger.

Discussion.—The presence of a deep transverse impression on the pronotum is reflected in the name *impressus*.

Pangaeus (Pangaeus) laevigatus Signoret

Plate figure 228

Pangoeus [!] *laevigatus* Signoret, 1882, p. 250, pl. 8, fig. 110.
Pangoeus [!] *stali* Signoret, 1882, p. 256. New synonymy.
Pagoeus [!] *buchanani* Signoret, 1882, p. 260, pl. 9, fig. 118. New synonymy.
Pangaeus laevigatus Lethierry and Severin, 1893, p. 69.
Pangaeus buchanani Lethierry and Severin, 1893, p. 69.
Pangaeus stali Lethierry and Severin, 1893, p. 70.

Diagnosis.—As here determined, *laevigatus* may be recognized in the subgenus by its large size, single setigerous puncture on submargin of head and one on costa and lack of a ventral, subbasal angulation on the posterior tibia.

Description.—Based on one male specimen, the type. Male: Oval, widest behind midlength.

Head: Length about two-thirds width, 1.13:1.68; interocular width, 1.06; anterior outline semicircular, juga slightly longer than clypeus, narrowly contiguous above its apex; surface shining, with few moderate, radiating rugae and scattered minute punctures; jugum longitudinally impressed medially, with one submarginal setigerous puncture; ocelli small, separated from eye by space distinctly more than transverse ocellar width; jugum ventrally and maxillary plate (except

near base) shining, impunctate. Antennal segments: I, 0.36; II, 0.35; III, 0.54; IV and V missing. Bucculae almost as high as labial II, evanescent posteriorly; labium reaching between middle coxae. Labial segments: I, 0.60; II, 1.16; III, 0.80; IV, 0.53.

Pronotum: Length more than half width, 2.15:3.78; anterior margin deeply, singly emarginate; lateral margin straight on basal half or more, with submarginal row of four setigerous punctures; transverse impression postmedian, weak, obsolete medially, marked by medially interrupted row of punctures; anterior lobe laterally with area of minute punctures enclosing few large punctures, elsewhere impunctate; posterior lobe mostly impunctate, with few obsolete punctures medially.

Scutellum: Length greater than width, 2.37:2.21; disc shining, with large scattered punctures.

Hemelytron: Clavus and corium alutaceous; clavus with one row of punctures; corium virtually impunctate except for single row paralleling claval suture; costa with one setigerous puncture; membranal suture straight, lateral angle not produced; membrane longer than basal width, just reaching apex of abdomen.

Propleuron: Shining, weakly alutaceous, with few large punctures in depression; prosternal carinae much less than half as high as labial II.

Mesopleuron: Evaporatorium attaining side margin of segment; lateral area irregular.

Metapleuron: Lateral margin of evaporatorium almost straight; lateral area polished, impunctate.

Legs: Posterior tibia without subbasal angulation ventrally, with four preapical spines on posteroventral margin.

Sternites: Obsoletely alutaceous, impunctate.

Terminalia: Genital capsule virtually impunctate except in lateral angles; apical margin slightly convex medially; gonostylus as illustrated (fig. 228).

Length of body: 7.66.

Female: As yet not properly associated with male; for further comments, see discussion below.

Type data.—Signoret's type (Wien) of *laevigatus* was from "Ocana," his type (Wien) of *stali* was from "Bresil," and his type (BrM) of *buchanani* was from "Amazon super."

Specimens studied.—1 male, 1 female. These respectively were the types of *laevigatus* and *stali* and were labeled "Ocana" and "Bresil."

Discussion.—The types of both *laevigatus* and *stali* were studied, and full notes on the type of *buchanani* were furnished. *P. laevigatus* was based on a male specimen, while both *stali* and *buchanani* were based on females. *P. laevigatus* is distinct from the others as keyed and described above. The placement of the two females here must be

considered a tentative but practical step. Rather than have these unidentified names carried indefinitely on lists of unidentified species, the author believes it desirable to associate them as closely as possible with some known form. They are thus still available if further study shows their distinctness, but are not dangling uncertainties. The female type of *stali* is almost identical with the male of *laevigatus* except that the ocelli are slightly larger and separated from the eye by a space not quite three times a transverse ocellar width, and has one posterior tibia with four and one with five spines on posteroventral margins.

The large size and uninterrupted mesopleural evaporatorium of *buchanani* permits its comparison with only two species—*aethiops* and *laevigatus*. The original description and notes on the type of *buchanani* show that it cannot be *aethiops* because the ocelli are too small and too widely separated from the eyes. Comparison with *laevigatus* yields nothing in the available information to contradict the placement of *buchanani* under that species as defined by the author after a study of the type. Therefore, *buchanani* is so synonymized here.

Pangaeus (*Pangaeus*) *moestus* (Stål)

Plate figure 229

Aethus moestus Stål, 1860, p. 13.—Walker, 1867, p. 153.
Pangaeus moestus Stål, 1876, p. 19.— Lethierry and Severin, 1893, p. 70.
Pangoeus [!] *maestus* [!] Signoret, 1882, p. 257, pl. 9, fig. 114.

Diagnosis.—Among those species of the subgenus with one submarginal setigerous puncture anterior to each eye and the posterior tibia of the male unmodified, this species can be delimited by the presence of two setigerous punctures on the costa and the corium being polished.

Description.—Based on one male. Male: Oval, widest behind midlength.

Head: Length two-thirds width, 0.88:1.31; interocular width, 0.80; anterior outline a full semicircle, clypeus as long as juga, strongly narrowed apically; surface shining, impunctate, with obsolete, radiating rugae; jugum with single submarginal puncture near eye; ocelli moderate, separated from eye by more than twice transverse ocellar width; jugum ventrally and maxillary plate, except basal margin, polished, impunctate. Antennal segments: I, 0.26; II, 0.26; III, 0.36; IV, 0.41; V, 0.52. Bucculae about half as high as labial II; labium attaining base of middle coxae. Labial segments: I, 0.44; II, 0.70; III, 0.56; IV, 0.34.

Pronotum: Length more than half width, 1.56:2.85; anterior margin shallowly emarginate; lateral margin almost straight on basal half, with five setigerous punctures submarginally; transverse impression

submedian, lightly impressed across full width, marked by regular row of punctures; anterior lobe impunctate except for four or five punctures laterally; posterior lobe with less than ten punctures medially.

Scutellum: Length less than width, 1.62:1.72; disc polished, with sparse, scattered punctures.

Hemelytron: Clavus and corium polished; clavus with one row of strong punctures; corium virtually impunctate except for one complete and interrupted second row of mesocorial punctures; costa with two setigerous punctures; membranal suture straight, lateral angle not prolonged; membrane longer than basal width, surpassing apex of abdomen.

Propleuron: Shining, distinctly punctate only in depression; prosternal carinae less than half as high as labial II.

Mesopleuron: Lateral area impunctate.

Metapleuron: Lateral margin of evaporatorium straight; lateral area impunctate.

Legs: Hind tibia without subbasal spine ventrally, posteroventral margin with four spines.

Sternites: Faintly alutaceous, impunctate.

Terminalia: Genital capsule with few punctures laterally, apical margin straight; gonostylus as illustrated (fig. 229).

Length of body: 5.38.

Type data.—Stål's type female (Stock) is from Rio de Janeiro, Brazil.

Specimens studied.—1 male, 1 female:

Guatemala: Acatenango, May 1948, H. T. Dalmat, 1 male (USNM).
Brazil: Rio de Janeiro, 1 female, the type specimen (Stock).

Discussion.—The single specimen assigned here is a male that agrees quite well with the female type except that its transverse pronotal impression is not quite as deeply impressed medially as is that of the type. At present, the author is not fully confident that he can accurately associate males and females of the same species within this section of the subgenus; but in order to tie down the name *moestus*, which was described from a female, he has chosen to apply it to a male which is structurally very similar to the type, even though from a widely removed locality. Assumption that the males and females are usually morphologically similar is based on the results of studying many females that bear data labels identical to those found on some males. The females usually are very similar but never show the ventral subbasal angulation on the hind tibia. Thus, a strong landmark of the males is missing from the females and adds to the difficulty of separating the nearly twice as many female specimens.

As soon as a means of delimiting the females of each species becomes evident, judgment on the wisdom of the present action may be passed.

Pangaeus (Pangaeus) neogeus, new species

PLATE FIGURE 230

DIAGNOSIS.—Among the species of this subgenus with the single setigerous puncture on the submargin of the head and two on the costa, the males of this species may be recognized by the combination of the lack of a ventral, subbasal angulation on the posterior tibia and the distinctly alutaceous corium.

DESCRIPTION.—MALE: Oval, widest posterior to midlength.

Head: Length about two-thirds width, 0.96(0.86–1.03):1.40(1.36–1.56); interocular width, 0.88(0.83–0.91); anterior outline a slightly flattened semicircle, juga slightly surpassing apex of clypeus and nearly or quite contiguous anterior to it; surface very feebly alutaceous, with obsolete minute punctures; jugum with one submarginal setigerous puncture next to eye; ocelli well developed, separated from eye by space less than twice transverse ocellar width; jugum ventrally and maxillary plate (except basally) shining, impunctate. Antennal segments: I, 0.26(0.26–0.27); II, 0.26(0.26–0.26); III, 0.42(0.40–0.46); IV, 0.48(0.46–0.50); V, 0.54(0.54–0.55). Bucculae almost as high as labial II, evanescent posteriorly; labium reaching between middle coxae. Labial segments: I, 0.47(0.43–0.50); II, 0.74(0.70–0.76); III, 0.48(0.42–0.53); IV, 0.36 (0.33–0.43).

Pronotum: Length more than half width, 1.82(1.62–2.01):3.34(3.00–3.64); anterior margin moderately, singly emarginate; lateral margin straight on basal two-thirds, with submarginal row of seven setigerous punctures; transverse impression slightly postmedian, weak, obsolete at middle, marked by medially interrupted row of punctures; anterior lobe with few moderate punctures laterally; posterior lobe with few scattered punctures medially.

Scutellum: The length usually less than the width, 1.97(1.78–2.12):2.06(1.82–2.21); shining, with several to many large, scattered punctures.

Hemelytron: Clavus and corium distinctly alutaceous; clavus with one row of punctures; corium impunctate except for one complete and basal half of second row paralleling claval suture; costa with two setigerous punctures; membranal suture nearly straight, lateral angle not produced; membrane longer than basal width, surpassing apex of abdomen.

Propleuron: Shining, few large punctures in depression; prosternal carinae almost half as high as labial II, rounded off posteriorly.

Mesopleuron: Lateral area polished, impunctate.

Metapleuron: Lateral margin of evaporatorium weakly concave; lateral area impunctate.

Legs: Posterior tibia without subbasal angulation ventrally, with five spines on posteroventral margin.

Sternites: Finely, minutely alutaceous, impunctate.

Terminalia: Genital capsule alutaceous, with few weak punctures laterally, apical margin straight or feebly concave; gonostylus as illustrated (fig. 230).

Length of body: 6.21.

Type data.—Holotype male (JCL), "Nova Teutonia, Santa Catarina, Brazil, X–20, 1948, F. Plauman." Paratypes as follows:

Brazil: Same locality and collector as holotype, Jan. 6, 1949, 1 male (JCL); Sept. 16, 1940, 2 males (JCL); Apr. 8, 1948, 1 male (JCL); Dec. 5, 1948, 1 male (JCL); June 19, 1935, 1 male (RLU); July 30, 1935 (RLU); Sept. 4, 1950 (JCL). Rio Grande do Sul, Stieglmayr, 7 males (Wien, RCF).

Paraguay: Horqueta, 45 miles east of Paraguay River, Nov. 27, 1933, A. Schulze, 1 male (JCL).

Discussion.—Except for some variation in the number of punctures on the pronotum and scutellum, this species appears to be quite constant in its features.

Pangaeus (*Pangaeus*) *piceatus* Stål

Plate figures 157, 231

Pangaeus piceatus Stål, 1862, p. 96; 1876, p. 19.—Uhler, 1877, p. 388; 1886, p. 3.—Distant, 1880, p. 6; 1899, p. 221.—Lethierry and Severin, 1893, p. 70.—Banks, 1910, p. 101.—Van Duzee, 1917, p. 21.—Barber and Bruner, 1932, p. 237.—Torre Bueno, 1939, p. 180.

Aethus piceatus Walker, 1867, p. 150.

Aethus tenuis Walker, 1867, p. 151.

Aethus parilis Walker, 1867, p. 153.

Aethus nitidulus Walker, 1867, p. 154. New synonymy.

Pangaeus ? tenuis Uhler, 1877, p. 390.

Pangoeus [!] *sallei* Signoret, 1882, p. 262, pl. 9, fig. 119. New synonymy.

Pangoeus [!] *piceatus* Signoret, 1882, p. 262, pl. 9, fig. 120.

Pangoeus [!] *petersi* Signoret, 1882, p. 264, pl. 9, fig. 122. New synonymy.

Pangoeus [!] *minimus* Signoret, 1882, p. 265, pl. 9, fig. 123. New synonymy.

Pangaeus minimus Uhler, 1886, p. 3.—Lethierry and Severin, 1893, p. 70.

Pangaeus sallei Uhler, 1886, p. 3.

Cydnus nitidulus Lethierry and Severin, 1893, p. 67.

Pangaeus petersi Lethierry and Severin, 1893, p. 70.

Pangaeus tenuis Lethierry and Severin, 1893, p. 70.

Pangaeus parilis "incerti loci" Lethierry and Severin, 1893, p. 81.

Diagnosis.—Among the species with one setigerous puncture on the submargin of the head and one on the costa, the males of this one may be recognized by the lack of ventral, subbasal angulation on the hind tibia coupled with the presence of but four spines on the posteroventral margin of the posterior tibia.

Description.—Male: Oval, broadest slightly posterior to mid-length.

Head: Length more than two-thirds width, 0.86(0.74–1.00):1.22 (1.06–1.36); interocular width, 0.75(0.66–0.84); anterior outline an elongate semicircle, juga little longer than clypeus and almost contiguous anterior to it; surface shining, usually with weak, radiating rugae; jugum with one setigerous puncture submarginally anterior to eye; ocelli moderate, removed from eye by space almost twice transverse ocellar width; jugum ventrally and maxillary plate (except basally) shining, impunctate. Antennal segments: I, 0.25(0.23–0.29); II, 0.21(0.21–0.23); III, 0.32(0.30–0.37); IV, 0.37(0.36–0.40); V, 0.47(0.46–0.52). Bucculae about half as high as labial II, evanescent posteriorly; labium extended between middle coxae. Labial segments: I, 0.36(0.35–0.43); II, 0.61(0.51–0.66); III, 0.50(0.44–0.56); IV, 0.37(0.32–0.40).

Pronotum: Length more than half width, 1.40(1.19–1.56):2.57 (2.13–2.92); anterior margin shallowly, doubly emarginate; lateral margin straight to weakly convex on basal two-thirds, with submarginal row of four or five setigerous punctures; transverse impression distinct across full width, weaker at middle, marked by medially interrupted row of punctures; anterior lobe impunctate except for occasional small punctures laterally, median line impressed from subapical line to between calli; posterior lobe with few scattered punctures on anterior half of middle area.

Scutellum: Length equal to or less than width, 1.46(1.24–1.64):1.48 (1.25–1.71); disc shining, with several widely scattered punctures.

Hemelytron: Clavus and corium polished; clavus with one row of punctures; corium obsoletely or not punctate except for punctures in one complete row and usually one partial row paralleling claval suture; costa with one setigerous puncture; membranal suture straight, lateral angle not produced; membrane longer than basal width, surpassing apex of abdomen.

Propleuron: Shining, impunctate or with few coarse punctures in depression; prosternal carinae less than half as high as labial II.

Mesopleuron: Evaporatorium reaching lateral margin; lateral area shining, obtusely rugose.

Metapleuron: Lateral margin of evaporatorium feebly concave; lateral area shining, impunctate.

Legs: Posterior tibia without subbasal angulation ventrally, with four spines on posteroventral margin.

Sternites: very finely alutaceous, impunctate.

Terminalia: Genital capsule with scattered fine punctures more abundant in lateral impressed areas, apical margin straight or slightly

convex medially, edge thickened laterally; gonostylus as illustrated (fig. 231).

Length of body: 4.79(4.22–5.21).

Type data.—Stål's type (Stock) is from Mexico. Walker described *nitidulus*, *parilis*, and *tenuis* from "Belize, [British] Honduras," "Amazon Region," and "Orizaba," Mexico, respectively (types in BrM). Signoret described and named *sallei* from "Laguayra [Venezuela] et Mexique"; *petersi* from "Perou"; and *minimus* from "Mexique." Two specimens (Wien) are labeled as types of *sallei* and *minimus* respectively. The type of *petersi* has not been located.

Specimens studied.—20 males:

Mexico: *Oaxaca:* Tuxtepec; July.

Guatemala: Antigua; August.

Costa Rica: Río Virillo, San José, San Pedro, Turrialba; January, June to August.

Puerto Rico: Ponce.

Colombia: Cali.

Brazil: Pará.

Peru: Pachitea.

Discussion.—A number of names based on small specimens must be considered here. Walker's three forms (*nitidulus*, *parilis*, and *tenuis*) present a special problem. In kind reply to a request for information on the types of them, Dr. China reported that all had a single submarginal setigerous puncture on the jugum and one on each costa, and that all were described from a female or male now lacking hind legs. This combination prevents placement of these forms at this time. They appear to fit equally well under *piceatus*, *docilis*, or the new species *quinquespinosus*. However, until further work furnishes characters which will permit interpretation of these forms, the author prefers to have the names fixed to a definite concept rather than leave them unattached, and for convenience attaches them here.

The three Signoret species here assigned to synonymy for the first time were so treated for the following reasons: *P. minimus*, as determined by a personal study of the type was based on a pale, teneral specimen of *piceatus*, the light color having prompted Signoret to remark that the pale color contrasted this species with all others in the genus. The situation involving *sallei* is more complex. Signoret gave Venezuela and Mexico as the type localities for this species. The specimen bearing the Mexican locality label now bears the type label and was kindly lent for study by Dr. Max Beier of the Naturhistorisches Museum in Vienna. It disagrees with the original descriptions in several important respects: (1) it was said to be similar to *piceatus* but described and figured as having four submarginal setigerous punctures on each jugum and two to five on the costa—the type has but one on each part; (2) only five, instead of the described

nine or ten submarginal setigerous punctures laterally on the pronotum; and (3) the original description stated that the mesopleural evaporatorium was "séparée de la suture par un espace lisse atteignant les deux tiers prés des hanches," while in the type this structure extends along the suture and reaches the lateral margin of the segment. These three features as described suggest that *sallei* is a member of the northern subgenus, *Homaloporus*. Perhaps the description was drawn from the Venezuelan specimen and not the Mexican one which now bears the type label. If this is true, the problem is still not solved. The author is not aware that any member of that subgenus occurs on continental South America and so cannot guess which, if any, of the known species of subgenus *Homaloporus* it might be. So, until the Venezuelan specimen is examined, the author accepts the Mexican individual as the type and places the name where the specimen obviously belongs, as a synonym of *piceatus*. Lastly, *petersi* also presents certain problems. As yet, the type has not been located so work must be done in reference to the original description and illustration. Of all the specimens which were small enough to be considered as meeting the "4 mill." size stated for this species, some were *docilis*, as delimited by the ventral subbasal angulation on the posterior tibia, and the remainder were *piceatus*. These included several specimens from the type locality of Peru. None of them showed the two submarginal setigerous punctures on the submargin of the jugum as described and illustrated by Signoret. But the present author has developed such a distrust for Signoret's "Revision" that he does not have much faith in either its text or its illustrations. If the text and figures are accurate concerning this species, then it is the only one in the genus lacking the lateral primary setigerous puncture immediately anterior to the eye. Since the presence of the three primary setigerous punctures is characteristic for all the known species of the genus and because Signoret's work has been found to be far from accurate in a number of other instances, the present author prefers to believe that Signoret failed to correctly interpret this part of the animal. Until a specimen is found which agrees with Signoret's works and disproves this belief, the author will cling to it and assign *petersi* to synonymy under *piceatus*.

Two of the Costa Rican specimens bear labels indicating they had been collected from cultivated plants, one from strawberry and the other from beans.

Pangaeus (Pangaeus) punctinotum, new species

Plate figures 47, 74, 232

Diagnosis.—The numerous distinct punctures behind the subapical impression and on the midline of the anterior pronotal lobe (fig. 74) mark this species as distinct from all others in the genus.

Description.—Based on a single specimen. Male: Oval, widest slightly behind midlength.

Head: Length more than two-thirds width, 0.93:1.31; interocular width, 0.82; anterior outline almost semicircular, juga longer than and contiguous beyond clypeus; surface impunctate, flattened, juga depressed medially and submarginally with two close-set setigerous punctures in front of eye and two more widely separated ones beyond; ocelli moderate, separated from eye by space almost three times transverse ocellar width; jugum ventrally and maxillary plate, except posteriorly, polished, impunctate. Antennal segments: I, 0.23; II, 0.23; III, 0.33; IV, 0.43; V, 0.60. Bucculae almost as high as labial II, evanescent posteriorly; labium reaching bases of middle coxae. Labial segments: I, 0.58; II, 0.73; III, 0.50; IV, 0.33.

Pronotum: Length more than half of width, 1.42:2.65; anterior margin moderately, singly emarginate; lateral margin feebly sinuate opposite ends of transverse impression, with six submarginal setigerous punctures; anterior lobe with numerous distinct punctures bordering the subapical impression, along midline and in depressed lateral area, collum and calli with minute punctures; transverse impression strongly impressed across full width, marked by row of very close-set punctures; posterior lobe with numerous strong punctures scattered across anterior half.

Scutellum: Length slightly less than width, 1.55:1.62; disc polished, with scattered punctures.

Hemelytron: Clavus and corium shining; clavus with incomplete row of punctures; mesocorium with one complete and one incomplete row of punctures paralleling claval suture, distinctly punctured basally and apically and obsoletely so discally; exocorium obsoletely punctured except at extreme base and apex; costa slightly reflexed, with two setigerous punctures; membranal suture straight, lateral angle somewhat prolonged; membrane little longer than basal width, reaching apex of abdomen.

Propleuron: Faintly alutaceous, distinctly punctate only in depression; prosternal carinae about half as high as labial II.

Mesopleuron: Evaporatorium reaching into posterolateral angle of segment, but not quite attaining lateral margin; lateral area with few punctures.

Metapleuron: Lateral margin of evaporatorium straight; lateral area impunctate.

Legs: Not specially modified.

Sternites: Polished, impunctate.

Terminalia: Genital capsule distinctly punctate only in lateral angles, apical margin straight, entire; gonostylus as illustrated (fig. 232).

Length of body: 5.28.

Type data.—Known only from the holotype male (BrM), "Mazaruni: High Forest, 20, viii, 1937, British Guiana: coll. Richardson & Smart. B. M. 1937–776."

Discussion.—The unusual punctation of the pronotum is unique within the genus and suggested the trivial name. Additional comments on this species may be found in the discussion of *rugonotum* which is also described as new in this paper.

Pangaeus (*Pangaeus*) *quinquespinosus*, new species

Plate figures 83, 158, 234

Diagnosis.—The male of this species can be recognized from the others with a single submarginal setigerous puncture anterior to each eye and polished coria by the simple posterior tibiae which have five preapical spines on the posteroventral margin.

Description.—Male: Oval, sides subparallel.

Head: Length more than two-thirds width, 0.89(0.87–0.91):1.36 (1.30–1.41); interocular width, 0.78(0.73–0.83); anterior outline semicircular, weakly angulated medially, juga longer than and narrowly continguous beyond clypeus; surface polished, impunctate, with mostly obsolete, radiating rugae; ocelli moderate, separated from eye by space almost twice transverse ocellar width; jugum ventrally and maxillary plate, except basally, shining, impunctate. Antennal segments: I, 0.25(0.24–0.26); II, 0.24(0.23–0.26); III, 0.33(0.32–0.36); IV, 0.43(0.40–0.50); V, 0.55(0.51–0.58). Bucculae almost as high as labial II; labium reaching between middle coxae. Labial segments: I, 0.42(0.40–0.46); II, 0.68(0.66–0.73); III, 0.52(0.47–0.56); IV, 0.35(0.34–0.40).

Pronotum: Length more than half width, 1.47(1.34–1.56):2.73 (2.47–2.86); anterior margin shallowly, doubly emarginate; lateral margin straight on basal half, with five setigerous punctures submarginally; transverse impression weak to obsolete medially, distinctly impressed laterally, marked by medially interrupted, regular row of close-set punctures merging laterally with few scattered punctures on both lobes; posterior lobe with less than a dozen punctures medially.

Scutellum: Length subequal to or shorter than width, 1.60 (1.42–1.69):1.61(1.43–1.75); disc shining, with numerous punctures except at base and apex.

Hemelytron: Clavus and corium polished; clavus with single row of punctures; mesocorium with two complete rows of coarse punctures paralleling claval suture, discally with fine punctures becoming denser towards base and apex; exocorium finely and more densely punctate than mesocorium; costa with one setigerous puncture; membranal

suture weakly bisinuate; membrane longer than basal width, surpassing apex of abdomen.

Propleuron: Feebly alutaceous, punctate in depression and anterior to acetabulum; prosternal carinae less than half as high as labial II.

Mesopleuron: Lateral area impunctate, weakly rugose.

Metapleuron: Lateral margin of evaporatorium distinctly concave; lateral area impunctate.

Legs: Not specially modified, posteroventral margin with five preapical spines.

Sternites: Shining, impunctate.

Terminalia: Genital capsule shining, with few punctures laterally; gonostylus as illustrated (fig. 234).

Length of body: 5.23(4.30–5.70).

Type data.—Holotype male (USNM 64423), "Barro Colo. Id., C.Z., VII–VIII–42, Jas. Zetek, No. 4985." Paratypes, four males: Same data as holotype (RCF); same locality and collector, Jan.-Feb. 1945 (USNM), Jan.-Feb. 1944 (USNM), April 1945 (USNM).

Discussion.—The only habit note attached to any specimen was the conventional "at light."

Pangaeus (Pangaeus) rufobrunneus Jensen-Haarup

Pangaeus rufobrunneus Jensen-Haarup, 1926, p. 49.

Diagnosis.—The combination of the four or five submarginal setigerous punctures on the jugum, the virtual absence of distinct punctures laterally on the anterior lobe of the pronotum and the presence of three or four setigerous punctures on costa sets this species apart from all others in the subgenus.

Description.—From one specimen, the type. Female: Oval, broadest behind midlength.

Head: Length slightly more than two-thirds width; 1.10:1.60; interocular width, 0.99; anterior outline semicircular, clypeus as long as juga, very slightly narrowed at apex; line on either side of clypeus extending posteriorly to between ocelli where they diverge around a median fovea; surface with numerous minute punctures on coarse, radiating rugae; jugum with submarginal row of four close-set punctures in front of eye and one separated distally; ocelli small, separated from eye by space about three times transverse ocellar width; jugum ventrally and maxillary plate (except at posterior margin) polished, impunctate. Antennal segments: I, 0.31; II, 0.37; III, 0.39, IV, 0.46; V, 0.54. Bucculae about as high as labial II; labium attaining base of middle coxae. Labial segments: I, 0.53; II, 0.80; III, 0.72; IV, 0.43.

Pronotum: Length more than half width, 1.82:3.31; anterior margin deeply, simply emarginate; lateral margins not sinuate, with

submarginal row of eight or nine setigerious punctures; transverse impression postmedian, weakly impressed and obsolete at middle, marked by medially interrupted row of numerous close-set, moderate punctures; surface with numerous scattered minute punctures; anterior lobe with few, obsolete, small punctures laterally; posterior lobe without coarser punctures.

Scutellum: Little longer than wide, 2.08:2.02; disc shining, with very many well-separated minute punctures and numerous widely separated coarser punctures becoming finer toward apex.

Hemelytron: Clavus and corium weakly alutaceous; clavus with single longitudinal row of punctures; mesocorium obsoletely punctured except for one complete and the suggestion of a second row of distinct punctures paralleling claval suture; exocorium with few obsolete punctures scattered along full length; costa with three or four setigerous punctures; membranal suture almost straight, lateral angle somewhat produced; membrane little longer than basal width, slightly surpassing apex of abdomen.

Propleuron: Alutaceous, without distinct punctures except ventrally in depression; prosternal carinae less than half as high as labial II.

Mesopleuron: Lateral area impunctate, with few oblique rugae.

Metapleuron: Lateral margin of evaporatorium distinctly concave; lateral area alutaceous, neither rugose nor punctate.

Sternites: Alutaceous, impunctate.

Legs: Posterior tibia without subbasal angulation ventrally, with four spines on posteroventral margin.

Length of body: 6.24.

Type data.—Jensen-Haarup listed type material from "Lima" and "Mendoza." The "Lima" specimen (Copen) was loaned for study by Dr. S. L. Tuxen. This specimen bears the label "Type., Coll. J-Hrp.," and is here designated lectotype.

Specimen studied: The female type (Copen) from Lima, Peru.

Discussion.—The median, interocular fovea around which the proximal ends of the clypeal sutures diverge appears to be unique not only within this genus but also within all other genera in the Western Hemisphere.

Pangaeus (Pangaeus) rubrifemur (Walker), new combination

Plate figure 233

Aethus rubrifemur Walker, 1867, p. 153.
Aethus rubrifemur "incerti loci" Lethierry and Severin, 1893, p. 81.

Diagnosis.—The presence of four setigerous punctures on the submargin of the head coupled with the very few scattered punctures laterally on the anterior lobe of the pronotum and the single setigerous

puncture on the costa mark this species as distinct from all others in the subgenus.

Description.—Based on one male. Male: Oval, slightly elongate.

Head: Length more than two-thirds width, 0.90:1.34; interocular width, 0.83; anterior outline a full semicircle, clypeus as long as juga and strongly narrowed apically; surface polished, impunctate, with weak radiating rugae; jugum with three or four setigerous submarginal punctures; ocelli small, separated from eye by space more than twice transverse ocellar width; jugum ventrally and maxillary plate, except posterior margin, polished, impunctate. Antennal segments: I, 0.26; II, 0.26; III, 0.36; IV, 0.43; V, 0.51. Bucculae about as high as labial II, evanescent posteriorly; labium reaching between middle coxae. Labial segments: I, 0.46; II, 0.70; III, 0.60; IV, 0.36.

Pronotum: Length more than half width, 1.49:2.69; anterior margin moderately, doubly emarginate; lateral margin narrowing from near base, not sinuate, with six setigerous punctures submarginally; transverse impression postmedian, moderately impressed for full width, marked by medially interrupted, regular row of coarse punctures; anterior lobe without strong punctures except for less than six laterally; posterior lobe with very few punctures clustered at middle.

Scutellum: Length and width subequal, 1.66:1.69; disc polished, with several scattered punctures except at base and apex.

Hemelytron: Clavus and corium finely alutaceous; clavus with single row of punctures; corium impunctate except for one complete and one interrupted row of distinct punctures paralleling claval suture; costa with one setigerous puncture; membranal suture straight, lateral area not produced; membrane longer than basal width, surpassing apex of abdomen.

Propleuron: Weakly alutaceous, punctured in depression and anterior to acetabulum; prosternal carinae less than half as high as labial II.

Mesopleuron: Lateral area impunctate.

Metapleuron: Lateral margin of evaporatorium slightly concave; lateral area impunctate.

Legs: Posterior tibia with distinct subbasal angulation and one subapical spine on posteroventral margin.

Sternites: Faintly alutaceous, impunctate.

Terminalia: Genital capsule weakly alutaceous, with few scattered punctures, apical margin nearly straight; gonostylus as illustrated (fig. 233).

Length of body: 5.25.

Type data.—The type male (BrM) was described by Walker from Rio de Janeiro.

Specimens studied.—1 male:

Paraguay: Horqueta, May 27, 1935, A. Schultze (JCL).

Discussion.—Dr. China's (MS) notes on the type enabled the author to associate the name *rubrifemur* with the present species.

This species and the other three that run into couplets 7 and 8 of the key to species appear to be closely related but are represented by very few specimens. Since two of these are known only from females and two from males, perhaps more information will show them to be the opposite sexes of only two species. This should not be especially surprising in view of the amount of sexual dimorphism that occurs within the subgenus.

Pangaeus (Pangaeus) rugonotum, new species

Plate figure 73

Diagnosis.—The numerous longitudinal rugae on the posterior third of the calli (fig. 73) identify this form within the genus.

Description.—Based on two females. Female: Oval, widest behind midlength.

Head: Length more than two-thirds width, 1.05:1.45; interocular width, 0.95; anterior outline semicircular, clypeus as long as juga, strongly narrowed apically; surface shining, impunctate; juga depressed medially, with four submarginal punctures, two close-set in front of eye and two more widely set distally; ocelli moderate, separated from eye by space about three times transverse ocellar width; jugum ventrally and maxillary plate, except posterior margin, polished, impunctate. Antennal segments: I, 0.31(0.30–0.32); II, 0.24(0.23–0.26); III, 0.41(0.40–0.42); IV, 0.47(0.46–0.49); V, 0.54(0.52–0.56). Bucculae about half as high as labial II; labium reaching between or just beyond middle coxae. Labial segments: I, 0.53(0.50–0.56); II, 0.76(0.76–0.77); III, 0.47(0.46–0.48); IV, 0.43(0.43–0.44).

Pronotum: Length more than half width, 1.46(1.43–1.49):3.07(2.95–3.20); anterior margin deeply, doubly emarginate; lateral margin entire, curved from near base; transverse impression submedian, depressed across full width, marked by row of small, close-set punctures; anterior lobe distinctly punctate laterally, discally obsoletely rugulose, posterior third of calli with numerous close-set, longitudinal rugae extending into transverse impression; posterior lobe with few widely separated small punctures, especially medially.

Scutellum: Length little less than width, 1.75(1.69–1.82):1.96(1.89–2.03); disc polished, with few, widely scattered punctures.

Hemelytron: Clavus and corium shining; clavus impunctate or with incomplete row of obsolete punctures; mesocorium with few punctures in impressed line paralleling claval suture and sometimes basal half of second such lines, elsewhere feebly or not punctured; exocorium impunctate; costa slightly reflexed, with one setigerous puncture; membranal suture straight, lateral margin very feebly or not pro-

duced; membrane longer than basal width, slightly surpassing apex of abdomen.

Propleuron: Faintly alutaceous, with few punctures in depression; prosternal carinae less than half as high as labial II.

Mesopleuron: Evaporatorium reaching into posterolateral angle but not quite reaching lateral margin of segment; lateral area impunctate.

Metapleuron: Lateral margin of evaporatorium straight; lateral area impunctate.

Legs: Not especially modified, with five spines on posteroventral margin.

Sternites: Polished, impunctate.

Length of body: 5.82(5.67–5.97).

Type data.—Holotype female (USNM 64424), "Corumba, Matto Grosso Brazil." Paratype: Vilcanota, Peru, H. G. Barber Collection, 1 female (USNM).

Discussion.—The impunctate head with four submarginal setigerous punctures on each side, the reduced punctation of the scutellum and coria and the failure of the mesopleural evaporatorium to reach all the way to the lateral margin of the segment suggests that this species is very close to the lone male on which the new species *punctinotum* is based, and perhaps may even be the female of that species. However, the pronotal punctation and sculpturing of the two forms plus the presence of but a single costal setigerous puncture in *rugonotum* is of sufficient worth to separate the two forms until biological evidence is available to indicate their sameness.

Pangaeus (*Pangaeus*) *semibrunneus*, new species

Plate figure 236*a*

Diagnosis.—The presence of a complete, submarginal row of setigerous punctures on each jugum plus the abundant moderate-sized but distinct punctures on the mesocorium will permit placement of this form within the subgenus.

Description.—Color: Head, thorax, and appendages light brown; hemelytra, scutellum, and abdomen dark brown to piceous.

Male (from two specimens): Oval to subparallel.

Head: Length greater than width, 1.04(1.04–1.04):1.38(1.36–1.40); interocular width, 0.85(0.84–0.86); anterior outline broadly rounded, slightly truncated apically, clypeus almost as long as juga, distinctly narrowed apically; surface distinctly convex, shining, impunctate; juga with coarse, transverse rugae; ocelli distinct, separated from eye by less than twice ocellar width; jugum ventrally and maxillary plate polished, impunctate. Antennal segments: I, 0.30(0.30–0.30); II,

0.19(0.18–0.20); III, 0.40(0.39–0.41); IV, 0.36(0.35–0.38); V, 0.39(0.39 0.40). Bucculae about two-thirds as high as labial II; labium reaching between middle coxae. Labial segments: I, 0.52(0.52–0.52); II, 0.85(0.82–0.89); III, 0.75(0.73–0.77); IV, 0.44(0.42–0.47).

Pronotum: Length about one-half width, 1.55(1.55–1.56):3.17(3.15–3.20); anterior margin simply, shallowly emarginate; lateral margin straight on basal two-thirds, incurved apically, with 11 to 12 setigerous punctures submarginally; transverse impression obsolete to moderately distinct, marked on lateral third by row of distinct, close-set punctures; anterior lobe impunctate except for a few obsolete, minute punctures laterally; posterior lobe with very few, widely scattered punctures on anterior half.

Scutellum: Length less than width, 1.82(1.80–1.84):2.01(1.99–2.04); disc shining, with fine punctures scattered between sparse, moderately coarse punctures.

Hemelytron: Clavus and corium shining, both with numerous fine but distinct punctures, those near claval suture on corium forming a single line of coarser punctures; costa with about ten setigerous punctures; membranal suture straight, lateral angle not prolonged; membrane longer than basal width, surpassing apex of abdomen.

Propleuron: Polished, impunctate; prosternal carinae sharp, less than one-fourth as high as labial II.

Mesopleuron: Lateral area impunctate.

Metapleuron: Lateral margin of evaporatorium concave; lateral area convex, impunctate.

Legs: Hind tibia minutely denticulate proximad of obtuse, subbasal emargination on posteroventral margin; spines of that margin longer and much finer than those of dorsal margin.

Sternites: Polished, with few scattered punctures on lateral third.

Terminalia: Genital capsule with patch of numerous minute punctures either side of midline, lateral angles impressed and rugulose; apical margin entire; gonostylus as illustrated (fig. 236a).

Length of body: 5.69(5.58–5.80).

Female: Similar to male, but without subbasal angulation on posteroventral margin of hind tibia.

Head: Length-width ratio, 1.02(0.98–1.04):1.36(1.32–1.44); interocular width, 0.91(0.91–0.92). Antennal segments: I, 0.29(0.28–0.31); II, 0.33(0.33–0.33); III, 0.40(0.38–0.42); IV, 0.38(0.38–0.38); V, 0.40(0.37–0.42). Labial segments: I, 0.62(0.60–0.66); II, 0.89(0.88–0.90); III, 0.76(0.73–0.79); IV, 0.31(0.30–0.32).

Pronotum: Length-width ratio, 1.66(1.60–1.74):3.64(3.44–3.76).

Scutellum: Length-width ratio, 2.15(2.00–2.40):2.16(2.04–2.36).

Length of body: 5.64(5.52–5.80).

Type data.—Holotype male and allotype female (both UnivTuc), "Tucuman Argentina Amaicha del Valle, Nov. 1945, A. Willink." Paratypes: One male, nine females, as follows:

Argentina: *Tucumán:* Amaicha del Valle, November 1945, A. Willink, 1 male, 5 females (UnivTuc, USNM, RCF). Concepción, December 4, R. Golbach, 1 female (UnivTuc). *Salta:* Cafayate, Feb. 20, 1949, H. J. Hayward, 1 female (UnivTuc); Mar. 7, 1939, Biraben-Scott, 2 females (UnivNac, RCF).

Discussion.—The presence of a submarginal row of peg-bearing setigerous punctures on the jugum sets apart this species and *subtilius* from all other members of the subgenus. But since this feature appears elsewhere within this and other genera it must be an adaptive character and therefore should not be used to erect categories in contradiction to the less variable, phylogenetically significant, nonadaptive structure of the evaporatorium and subapical impressed line of the pronotum. The stout form, transverse rugae on the head, the numerous lateral hairs and the differentiated spines of the posterior tibia are suggestive of *semibrunneus* and *xanthopus*, while the subbasal angulation on the posteroventral margin of the hind tibia reminds one of *aethiops* and certain other species within the subgenus.

On the basis of the locality, the submarginal row of pegs on the jugum, and a reluctance to accept Signoret's work as accurate, the author considered this form to be *subtilius*. However, Dr. Blöte's comparison of specimens with the type of that species showed their distinctness.

***Pangaeus* (*Pangaeus*) *aethiops* (Fabricius)**

Plate figures 14, 24, 46, 103, 127, 155, 177, 235

Cimex aethiops Fabricius, 1787, p. 296.
Cydnus aethiops Fabricius, 1803, p. 186.
Cydnus serripes Westwood, 1837, p. 19. New synonymy.
Aethus ? aethiaps Walker, 1868, p. 534.
Pangaeus aethiops Stål, 1868, p. 7.
Cydnus serripes "loc. incert." Stål, 1876, p. 26.
Aethus margo Dallas, 1851, p. 116.—Walker, 1867, p. 151. New synonymy.
Pangaeus margo Stål, 1862, p. 95; 1876, p. 19.—Uhler, 1877, p. 387.—Distant, 1880, p. 5, pl. 2, fig. 15.—Lethierry and Severin, 1893, p. 70.—Banks, 1910, p. 100.—Van Duzee, 1917, p. 20.—Torre Bueno, 1939, p. 180.
Pangoeus [!] *confusus* Signoret, 1881a, p. 642; 1882, p. 249, pl. 8, fig. 107 (not 108 as stated in text). New synonymy.
Pangoeus [!] *serripes* Signoret, 1882, p. 247, pl. 8, fig. 106.
Pangoeus [!] *margo* Signoret, 1882, p. 248, pl. 8, fig. 108 (not 107 as stated in text).
Pangaeus serripes Uhler, 1886, p. 3.—Lethierry and Severin, 1893, p. 70.
Pangaeus confusus Uhler, 1886, p. 3.

Diagnosis.—The male is easily recognized within the genus by the deep medioapical emargination of the genital capsule (fig. 177); the female is not so positively identified, even within the subgenus, except

that the large ocelli, which are separated from an eye by less than the transverse diameter of an ocellus (fig. 46), appear to be serviceable for that purpose within the subgenus.

DESCRIPTION.—MALE: Oval, widest near midlength.

Head: Length about two-thirds width, 1.39(1.15–1.56):2.14(1.84–2.36); interocular width, 1.15(0.98–1.30); anterior outline a slightly elongate semicircle, juga as long as or longer than clypeus and nearly or quite contiguous beyond its apex; surface polished, with few scattered minute punctures, apex distinctly recurved; juga longitudinally impressed medially, with one submarginal setigerous puncture immediately anterior to eye; ocelli large, separated from eye by space less than transverse ocellar width (fig. 46); jugum ventrally and maxillary plate, except posterior fourth, polished, impunctate. Antennal segments: I, 0.39(0.33–0.43); II, 0.41(0.33–0.46); III, 0.57(0.47–0.63); IV, 0.69(0.56–0.76); V, 0.78(0.66–0.83). Bucculae (fig. 24) almost as high as labial II; labium reaching between or slightly beyond middle coxae. Labial segments: I, 0.70(0.58–0.83); II, 1.19(0.93–1.30); III, 0.97(0.80–1.06); IV, 0.56(0.50–0.62).

Pronotum: Length more than half width, 2.47(2.15–2.86):4.55(3.84–5.04); anterior margin shallowly, doubly emarginate; lateral margin nearly straight on basal two-thirds, with four or five setigerous punctures submarginally; transverse impression weak but evident, marked by medially interrupted row of punctures; anterior lobe with median line finely impressed on apical half, impunctate except for variable lateral patch; posterior lobe with several to many punctures scattered across full width, most abundant medially.

Scutellum: Length equal to or slightly longer than width, 2.97(2.34–3.16):2.79(2.34–3.16); disc polished, with numerous punctures scattered nearly to apex.

Hemelytron: Clavus and corium alutaceous; clavus with one complete and sometimes a second incomplete row of punctures; mesocorium with one complete and sometimes another incomplete or complete row of punctures, elsewhere impunctate or with obsolete to distinct punctures, especially basally and at outer apical angle; exocorial punctures likewise varying from absent to distinct; costa with two setigerous punctures; membranal suture straight, lateral angle feebly or not produced; membrane longer than basal width, surpassing apex of abdomen.

Propleuron: Weakly alutaceous, punctured in depression and sometimes anterior to acetabulum; prosternal carinae less than half as high as labial II.

Mesopleuron: Lateral area with few or no punctures.

Metapleuron: Lateral margin of evaporatorium weakly or not concave; lateral area impunctate.

Legs: Posteroventral margin of hind tibia with fine tubercles basal of distinct angulation at basal sixth (fig. 155) and three or four subapical spines.

Sternites: Without distinct punctures except in spiracular area.

Terminalia: Genital capsule laterally impressed and more distinctly punctate, apical margin slightly elevated either side of broad, deep, U-shaped median emargination (fig. 177); gonostylus as illustrated (fig. 235).

Length of body: 8.53(7.34–9.73).

FEMALE: Similar to male but posterior tibia without subbasal angulation and with five or six subapical spines on posteroventral margin.

Head: Length-width ratio, 1.28(1.13–1.56):1.93(1.67–2.27); interocular width, 1.10(1.03–1.24). Antennal segments: I, 0.36(0.28–0.43); II, 0.36(0.28–0.43); III, 0.52(0.50–0.58); IV, 0.62(0.53–0.76); V, 0.68(0.63–0.80). Labial segments: I, 0.64(0.60–0.80); II, 1.09(1.00–1.23); III, 0.83(0.71–0.93); IV, 0.51(0.46–0.58).

Pronotum: Length-width ratio, 2.31(2.02–2.86):4.29(3.91–5.06).

Scutellum: Length-width ratio, 2.64(2.40–3.20):2.60(2.28–3.20).

Length of body: 7.91(7.01–9.45).

TYPE DATA.—Fabricius' type (Copen) was from "Cajenne" in French Guiana. The type (OxUniv) of *Cydnus serripes* was described by Westwood from "Insula Sti. Vincentii"; Dallas' type of *Aethus margo*, a male (BrM) without posterior tibiae, was reported from "Columbia [!]." Since Signoret proposed the name *confusus* for those Mexican specimens reported by Stål (1862, p. 95) as *margo*, those specimens must constitute the type series and probably are now in the Stål collection in the Naturhistoriska Riksmuseum, Stockholm.

SPECIMENS STUDIED.—43 males, 67 females.

MEXICO: *Chiapas:* Finca Esperanza, La Esperanza; May. *Guerrero:* Iquala; September. *México:* Tejupilco: September. *San Luis Potosí:* El Salto, Tamazunchale, Valles; May, June. *Yucatán:* Colonia Yucatán; August.

GUATEMALA: Finca El Cipres, south of Flores, Sacapulas; June.

PANAMA: Progreso. *Canal Zone:* Madden Dam.

HONDURAS. "Ratuch River"; June.

NICARAGUA: Managua.

GRENADA: Balthazar (windward side), Grand Etang (leeward side).

TRINIDAD: Near Port of Spain, St. Augustine; August.

FRENCH GUIANA: Cayenne; February.

BRITISH GUIANA: Source of Río Essequibo.

VENEZUELA: Mérida, Caracas.

COLOMBIA· "W. Colomb.," Bonda, Cali, Muzo, Santa Marta; May, November.

ECUADOR: Balzapamba; March.

BRAZIL: Grajaú, Manáos, Matto Grosso, Mirim, Pará, Pernambuco, Rio de Janeiro, Santa Cruz, Santarém, São Paulo, Taperina; July to October.

PERU: Yurimaguas; April, June.

PARAGUAY: Horqueta, Sapucay; February, July.

BOLIVIA: Santa Cruz de la Sierra, Provincia de Sara; November.
ARGENTINA: El Quemado.
URUGUAY: Corralitos: January.

DISCUSSION.—Personal examination of Fabricius' type, a male, and Westwood's type of *serripes*, a headless male, leaves no doubt about their identity; also, they are identical.

The wide geographic range and structural variability of *aethiops* has permitted the forming of many synonyms. Even so, this is quite surprising in view of the strong features which clearly define it: (1) strongly emarginate apical margin of the male genital capsule; (2) the subbasal angulation on the posteroventral margin of the hind tibia; (3) the large ocelli set close to the eyes; and (4) the mesopleural evaporatorium which extends all the way to the lateral margin of the segment. Not one of the descriptions of *aethiops* or its synonyms pointed out one of these characters, although Signoret's illustration of the pleurae did show the extent of the evaporatorium.

The type of *Aethus margo* Dallas is a male (BrM). According to notes furnished by Dr. China it lacks the hind tibiae but does have large ocelli and an apical emargination on the genital capsule, and so must fall as a synonym of *aethiops*. While the types of Signoret's *confusus* have not been located, the various features which he used to separate it from *margo* fall within the range of variation exhibited by *aethiops* as here defined and so *confusus* cannot be maintained as a distinct species.

Pangaeus (Pangaeus) subtilius (Signoret), new combination

Homaloporus subtilius Signoret, 1881b, p. 331, pl. 11, fig. 49.—Lethierry and Severin, 1893, p. 65.
Homaloporus subtilisus [!] Uhler, 1886, p. 3.

DIAGNOSIS.—Within the subgenus, *P. subtilius* may be recognized by having on the submargin of the jugum a complete row of setigerous punctures (at least five or six of these having pegs) and virtually no punctures on the mesocorium.

DESCRIPTION.—In the absence of specimens for study, the original description is quoted:

> Cordoba (Cong. Arg.).—Long. 5 mill., larg. 2¾ mill (Musée royal de Leyda).
>
> Ovale; d'un brun marron foncé, brilliant, finement et discrètement striolé et ponctué.
>
> Tête arrondie, bordée de spinules et de cils, six ou sept spinules, cinq ou six cila, non compris les ordinaries du vertex et de la naissance du rostre. Antennes jaunes à la base, avec le deuxième article plus court que le troisième. Rostre jaune, atteignant les pattes intermédiares, le premier article entièrment cáche (vu de côté) par les carène rostrales. Prothorax avec les côtés subparalleles et ciliés, glabre sur le disque, ne présentant qu'une ligne de points sur l'impression transverse et deux très fines stries faiblement ponctuées sur le disque postérieur, le hord antérieur lisse, avec un sillon bien marqué. Écusson étroitement arrondi

à son extrémité, qui est légèrement impressionnée: disque discrètement ponctué. Élytres avec la corie et l'espace marginal presque lisses, la ponctuation étant très fine, les séries près des nervures très senties: plaque mate supérieure atteignant à la base le bord latéral, presque lisse, l'inférieure avec la ligne latéral presque droite, à peine striée: les espaces lisses, glabres. Canal ostiolaire plus large vers le sommet qu'à la naissance et terminé par un lobe arrondi, échancré en arrière avec une petit valve arrondie.

Cette espèce est très voisine de l'*Hom. congruus*, dont elle diffère par l'ostiole et surtout par le lobe médian qui ne présente pas les deux spinules.

Type data.—The type (Rijks) was reported from Córdoba, Argentina.

Discussion.—Dr. Blöte compared certain specimens with the type and made possible the present definition of this form and pointed out the differences between it and *P. semibrunneus*, new species. He confirmed most of Signoret's description of the species, but reported that there are only two setigerous punctures on the left costa and three on the right—information that made it possible to establish that Signoret's sketch does not differentiate the hairs of the costa from those of the abdomen so that there appears to be nine present on each costa. Dr. Blöte further pointed out that the head does not have distinct, transverse rugae such as are present on the head of the new species *semibrunneus*.

Genus *Prolobodes* Amyot and Serville

Lobostoma Amyot and Serville, 1843, p. 87 (nec Berthold, 1827, p. 528, in Trematoda; nec Rafinesque, 1831, p. 5, in Coelanterata; nec Gundlach, 1840, p. 356, in Mammalia).

Prolobodes Amyot and Serville, 1843, p. 676.

Discostoma Scudder, 1890, p. 452.

Diagnosis.—This genus is remarkable among all genera of Cydnidae, except *Scaptocoris*, by reason of the large, semicircular, foliaceous lobe on the second segment of labial II (fig. 36). It is easily separated from *Scaptocoris* by many characters, not the least of which is the fact that the members of *Prolobodes* have the anterior tarsi inserted at the tip of the tibia (fig. 122) instead of near middle of tibia as in *Scaptocoris* (fig. 115).

Description.—Size very large (11.5–17.0), dorsum nearly as strongly convex as venter, shape oval, greatest width posterior to midlength.

Head: Length about two-thirds width, oblique, flattened except for tumid interocular area and strongly reflexed juga (fig. 36); jugal margins entire, with submarginal row of thirteen to sixteen coarse, close-set setigerous punctures bearing long hairlike setae but no blunt, peglike setae; eyes prominent; ocelli large, situated on or behind line connecting posterior margins of eyes, separated from

latter by space not as great as transverse ocellar width; antennae 5-segmented, short, not reaching posterior margin of pronotum, II shortest, III, IV, and V subequal, longer than I; bucculae almost as high as labial II (without lobe), evanescent posteriorly; labium reaching between middle coxae (fig. 36), II longest, strongly curved apically and with large, semicircular, foliaceous lobe, this often hidden between anterior coxae, IV shortest.

Pronotum: Length more than half width; anterior margin moderately, doubly emarginate; lateral margin straight on basal half, with submarginal row of 14 to 19 setigerous punctures; transverse impression submedian, impressed or not, marked by row of distinct punctures; anterior lobe subapically with punctate impressed area which is larger in males than females.

Scutellum: Wider than long; width of broadly rounded apex less than half the length of membranal suture.

Hemelytron: Corial areas well-defined and, except for limited area on exocorium, more or less uniformly punctate throughout; membranal suture weakly concave, lateral angle noticeably produced; membrane almost two-fifths hemelytral length, its length greater than basal width, surpassing apex of abdomen.

Propleuron: Finely punctate in depression; prosternal carinae very low, a thick, blunt ridge.

Mesopleuron (fig. 110): Flat, impunctate, evaporatorium reaching into posterolateral angle, attaining lateral margin of segment.

Metapleuron (fig. 110): Flattened to slightly convex, osteolar peritreme reaching half-way across segment, without terminal modification, osteole opening posteriorly; evaporatorium occupying mesal two-thirds of segment.

Legs: Moderately large; anterior tibia (fig. 122) not surpassing tarsal insertion, dorsally with nine to ten stout, blunt spines; posterior tibia strongly compressed, curved, with rows of spines restricted to dorsal and ventral margin, spines of posteroventral margin much longer and more slender than those of dorsal margin; tarsal I longest, II shortest.

Sternites: Polished, with few punctures, especially laterally; each segment laterally with one or two setigerous tubercles submarginally.

Terminalia: Male genital capsule slightly emarginate at middle apex.

One nymph, a third-instar, was available for study. It showed the semicircular foliaceous lobe on the labium, the submarginal row of hairlike setae on the head, and the differences in the vestiture of the posterior tibia.

Type of genus.—Of *Lobostoma* Amyot and Serville (1843), *Cydnus giganteus* Burmeister (1835, p. 375), designated by Kirkaldy (1903,

p. 232). Since *Prolobodes* and *Discostoma* were proposed to replace the preoccupied *Lobostoma*, they must both take *Cydnus giganteus* as type, by objective synonymy.

Distribution.—Available specimen records indicate this genus occurs in tropical America from Nicaragua in the north to southern Brazil and Paraguay in the south.

Discussion.—There can be little doubt about the species of this genus being closely allied to those of *Cyrtomenus*, but the foliaceous, semicircular lobe on labial II sets them apart morphologically and probably also represents a biological difference. Just what might be the significance of such a structure is conjectural. Within it may be seen the coiled, elongate stylets. This would suggest a peculiarity in feeding habits. China (1931) reported that such coiling of the stylets appeared in three other families of the Hemiptera, the Aradidae, Termitaphididae and some Plataspidae. He further pointed out that although these groups are not otherwise closely related they all feed on fungi. Could it be that the members of *Prolobodes* are also fungus-feeders? Or do they employ these long slender structures in probing for roots and thus avoid the necessity of burrowing to each root from which they feed? Only observations on living animals will conclusively determine the exact use of such a structure.

Key to the known species of *Prolobodes*

1. Anterior pronotal lobe with not more than five or six coarse punctures laterally, usually with none . . . . **gigas** (Signoret) (p. 512)
   Anterior pronotal lobe with 15 or more coarse, deep punctures laterally . . 2
2. Pronotum with a weak, transverse impression near midlength, this with numerous crowded, coarse, deep, impressed punctures which often show longitudinal rugae between them (fig. 11) . . . **giganteus** (Burmeister) (p. 510)
   Pronotum without a transverse impression near midlength, punctures in that area coarse, deep, but neither crowded nor impressed nor with rugae between them . . . . **reductum** (Amyot and Serville) (p. 513)

Prolobodes giganteus **(Burmeister)**

Plate figures 11, 17, 18, 36, 110, 122, 141, 237

Cydnus giganteus Burmeister, 1835, p. 375.
Lobostoma giganteus Amyot and Serville, 1843, p. 88.
Prolobodes giganteus Amyot and Serville, 1843, p. 676, pl. 2, fig. 6.—Lethierry and Severin, 1893, p. 62.
Lobostoma gigantea Walker, 1867, p. 147.—Stål, 1876, p. 18.—Distant, 1880, p. 1.
Lobostoma giganteum Dallas, 1851, p. 111.—Signoret, 1881b, p. 194, pl. 6, fig. 14.

Diagnosis.—The heavy pronotal punctation, especially on the sides of the anterior lobe, plus the presence of a weakly impressed transverse impression on the pronotum limit this species within the genus.

DESCRIPTION.—MALE:

Head: Length about two-thirds width, 2.45(2.38–2.58):3.66(3.56–3.78); interocular width, 2.30(2.22–2.41); jugum dorsally polished, with distinct, radiating rugae and numerous minute punctures; juga ventrally irregularly and usually weakly rugulose. Antennal segments: I, 0.79(0.70–1.02); II, 0.54(0.46–0.63); III, 0.95(0.83–1.02); IV, 0.97(0.95–1.01); V, 0.99(0.90–1.10). Labial segments: I, 1.26(1.22–1.30); II, 1.85(1.78–1.91); III, 1.53(1.45–1.59); IV, 1.07(1.00–1.13).

Pronotum: Length more than half width, 5.23(4.78–5.57):9.48(8.83–10.10); transverse impression weak but evident across entire width and with numerous crowded, sunken punctures; anterior lobe with numerous (20 or more) moderate punctures laterally; posterior lobe on anterior half with numerous punctures sparser and slightly finer than those of transverse impression.

Scutellum: Wider than long, 6.21(5.76–6.73):5.52(5.12–5.97); disc with numerous, in part contiguous, punctures.

Propleuron, mesopleuron, and metapleuron: As described for genus.

Legs and sternites: As described for genus.

Terminalia: Gonostylus as illustrated (fig. 237).

Length of body: 15.52(14.40–15.72).

FEMALE: Rather similar to male, but anterior pronotal impression weaker and less extensive and measurements more variable.

Head: Length-width ratio, 2.46(2.21–2.60):3.63(3.21–3.94); interocular width, 2.29(2.06–2.40). Antennal segments: I, 0.66(0.62–0.70); II, 0.50(0.40–0.60); III, 0.94(0.90–0.96); IV, 0.89(0.83–0.96); V, 0.94(0.88–1.01). Labial segments: I, 1.23(101–1.33); II, 1.80 (1.63–1.96); III, 1.57(1.46–1.66); IV, 1.09(1.01–1.18).

Pronotum: Length-width ratio, 4.99(4.35–5.46):9.35(7.64–10.05).

Scutellum: Width-length ratio, 5.88(4.95–6.45):5.53(4.52–6.00).

Length of body: 14.64(12.89–16.18).

TYPE DATA.—The author has not yet located the types which Burmeister described "von Para und Siaras," Brazil.

SPECIMENS STUDIED: 8 males, 12 females.

BRAZIL: Caviana, Chapada, Corumbá, Rio San Francisco, Saltada Cruzed, Salta Grande, São Paulo; May, October to December.

BOLIVIA: Provincia de Sara; November.

PARAGUAY: Horqueta, Villarrica, Trinidad; October to December.

DISCUSSION.—Burmeister's choice of a name for this species was accurate because some of its individuals are the largest cydnids in the world, both in length and bulk. In size it is rivalled only by the other species of the genus and a few of the larger species of *Cyrtomenus*.

Prolobodes gigas (Signoret)

Plate figure 238

Lobostoma gigas Signoret, 1881b, p. 195, pl. 6, fig. 15.
Prolobodes gigas Lethierry and Severin, 1893, p. 62.

Diagnosis.—The absence of prominent, coarse punctures laterally on the anterior lobe of the pronotum (one specimen showed a few, less than six) marks this species from the other two within the genus.

Description.—Male:

Head: Length nearly two-thirds width, 2.49(2.23–2.63):3.71(3.56–3.88); interocular width, 2.17(2.08–2.22); juga dorsally with radiating rugae weak to obsolete, impunctate or with obsolete minute punctures. Antennal segments: I, 0.75(0.73–0.80); II, 0.61(0.54–0.70); III, 0.96(0.93–1.01); IV, 1.03(0.98–1.07); V, 1.10(1.06–1.15). Labial segments: I, 1.31(1.16–1.38); II, 1.75(1.72–1.82); III, 1.59(1.39–1.76); IV, 1.09(1.06–1.15).

Pronotum: Length more than half width, 5.07(4.64–5.47):8.94(8.37–9.31); transverse impression absent or weakly indicated laterally, marked by a band of several, usually well separated punctures; anterior lobe not or only very feebly and minutely punctured (one specimen with a few moderate punctures laterally); posterior lobe with a few widely separated punctures on anterior half.

Scutellum: Wider than long, 5.72(5.40–6.27):5.21(4.80–5.39); disc with several irregularly but distinctly separate d, moderate punctures.

Propleuron, mesopleuron, and metapleuron: As described for genus.

Legs and sternites: As described for genus.

Terminalia: Gonostylus as illustrated (fig. 238).

Length of body: 15.15(13.94–15.90).

Female: Similar to male but jugal rugae and anteapical pronotal impression weaker, measurements mostly smaller.

Head: Length-width ratio, 2.25(2.18–2.31):3.49(3.37–3.68); interocular width, 2.09(2.02–2.18). Antennal segments: I, 0.70(0.66–0.73); II, 0.55(0.53–0.58); III, 0.85(0.84–0.87); IV, 0.93(0.92–0.96); V, 1.04(1.01–1.08). Labial segments: I, 1.23(1.22–1.26); II, 1.72(1.70–1.74); III, 1.52(1.40–1.64); IV, 1.06(1.02–1.10).

Pronotum: Length-width ratio, 4.20(3.91–4.48):7.72(7.23–8.17).

Scutellum: Width-length ratio, 5.07(4.65–5.31):4.79(4.61–5.10).

Length of body: 13.26(12.60–13.68).

Type data.—Signoret gave the type locality as "Santa-Fe-de-Bogata." A female (Wien) labeled "Bogata" and "*gigas*" is marked with a red type label. The three legs from the right side of the type are glued to a small card on another pin; antennals II–V are missing from both sides, as are all middle and hind tarsi; all bristles have been abraded from head, pronotum and costa.

Specimens studied.—6 males, 5 females:

Panama: *Canal Zone:* Barro Colorado, June 22, 1924, N. Banks, 1 female (MCZ); November, M. Bates, 1 male (MCZ); date unknown, Dodge (labeled *Cyrtomenus grossus*), 1 male (MCZ); Nov. 25, 1893, E. I. Huntington, F.301125, 1 male (AmM). Cocoli, Aug. 21, 1946, N. L. H. Krauss, 1 male, 1 female (USNM). Gatún, August 1922, 1 female (USNM). *Panama:* La Chorrera, Busck, 1 female (USNM).

Nicaragua: Near Bluefields, Aug. 31, 1892, W. Richmond, 1 female (USNM).

Colombia: Bogotá, 1 female (Wien). Don Amo, July, Acc. No. 19992, 2 males (Car).

Prolobodes reductum (Amyot and Serville)

Plate figure 239

Lobostoma reductum Amyot and Serville, 1843, p. 88.—Signoret, 1881b, p. 195, pl. 6, fig. 16.

Prolobodes reductus Amyot and Serville, 1843, p. 676.—Lethierry and Severin, 1893, p. 62.

Lobostoma reducta Stål, 1876, p. 18.

Diagnosis.—The presence of numerous punctures laterally on the anterior lobe of the pronotum plus the lack of an impressed transverse impression set this species apart from the other two in the genus.

Description.—Male:

Head: Length about two-thirds width, 2.29(2.21–2.40):3.42(3.36–3.58); interocular width, 2.16(2.15–2.20); juga dorsally with very weak, radiating rugae and usually obsolete minute punctures. Antennal segments: I, 0.72(0.63–0.80); II, 0.63(0.60–0.70); III, 0.86(0.79–0.90); IV, 1.01(0.93–1.10); V, 1.05(1.01–1.09). Labial segments: I, 1.20(1.13–1.26); II, 1.73(1.66–1.77); III, 1.50(1.43–1.59); IV, 1.04(0.96–1.14).

Pronotum: Length more than half width, 4.79(4.49–5.18):8.15(7.50–8.70); transverse impression absent or very weak laterally; anterior lobe with 15 or more punctae laterally; posterior lobe with few widely scattered punctae on anterior half.

Scutellum: Wider than long, 5.35(4.95–5.67):4.98(4.65–5.25); disc with numerous, irregularly spaced punctures, some tending to coalesce and form transverse rugae between them.

Propleurae, mesopleurae and metapleurae: As described for genus.

Legs and sternites: As described for genus.

Terminalia: Gonostylus as illustrated (fig. 239).

Length of body: 14.01(13.27–14.58).

Female: Similar to male but anterior pronotal impression weaker and measurements more variable.

Head: Length-width ratio, 2.25(2.08–2.47):3.34(3.09–3.74); interocular width, 2.08(1.95–2.21). Antennal segments: I, 0.71(0.66–0.78); II, 0.53(0.51–0.56); III, 0.76(0.73–0.81); IV, 0.90(0.80–0.98); V,

0.99(0.90–1.13). Labial segments: I, 1.15(1.08–1.30); II, 1.66(1.62–1.74); III, 1.43(1.33–1.74); IV, 1.01(0.98–1.05).

Pronotum: Length-width ratio, 4.38(3.60–5.08):7.60(6.63–8.67).

Scutellum: Width-length ratio, 5.18(4.50–5.81):4.88(4.27–5.42).

Length of body: 13.30(11.62–14.61).

Type data.—The type of this species was said by Amyot and Serville to have come from "Cayenne," French Guiana. Its present location is unknown to the author.

Specimens studied.—10 males, 9 females:

Trinidad: St. Benedict Mt., Tunapuna; September.

British Guiana: Bartica District; June, July.

French Guiana: Maroni River, St. Jean.

Brazil: Alagoinhas, Hyutanahã, Santarém, Taperhina.

Peru: "Achinamiza"; December.

Bolivia: Buena Vista, Ichilo, Santa Cruz, Provincia de Sara; November, December.

Paraguay: Villarrica.

Discussion.—As originally proposed, this name appeared in parentheses in a paragraph following the treatment of *giganteus*. This apparently explains why several of the early workers overlooked it during their studies.

Genus *Cyrtomenus* Amyot and Serville

Cyrtomenus Amyot and Serville, 1843, p. 90.
Syllobus Signoret, 1879, p. clxxii. New synonymy.

Diagnosis.—The lack of a distinct subapical stria from side to side on the pronotum, the compressed posterior tibia on which the spines of the posteroventral margin are longer and distinctly more slender than those on the dorsal margin, and the simple second labial combine to separate this genus from all others in the Western Hemisphere.

Description.—Size large, length of body 6.4–13.3 mm; shape oval, widest distinctly posterior to midlength; dorsum strongly and venter still more strongly convex.

Head: Nearly or about two-thirds as long as wide, oblique, flattened or convex above, with a distinct, marginal carina; juga equal to or longer than clypeus, converging and sometimes contiguous in front of the latter; margins rounded or sometimes triangularly produced either side of apex (fig. 58); a submarginal row of seven to twelve coarse punctures, each bearing a single long, tapering hairlike seta; ocelli moderate to large, situated on or slightly behind a line connecting hind margins of eyes, separated from eyes by less than twice the width of ocellus; antennae 5-segmented, II usually shortest (equal to III in *marginalis*), III and IV often subequal, V longer or shorter than IV;

bucculae low to moderately high, reaching nearly to base of head; labium variable in length, reaching to middle coxae or as far as base of abdomen, II compressed but without a semicircular foliaceous lobe above, II and III usually subequal and longer than I or IV.

Pronotum: Length about three-fourths width, narrowed from base; anterior margin moderately and broadly emarginate; lateral margins carinate, arcuate for full length or straight to weakly concave on basal half or more, submarginal row of 6 to 25 coarse, setigerous punctures; posterior margin broadly rounded; transverse impression near midlength, varying from distinct to obsolete, usually marked with a row or band of coarse punctures; male of some species with a broad, shallow, median, subapical impression.

Scutellum: Width equal to or shorter than length, triangular, apex narrowed, narrower than half the length of the coriomembranal commissure; disc with widely, irregularly scattered fine or coarse punctures.

Hemelytron: Polished, more or less punctured throughout; corioclaval suture distinct; clavus usually with single row of coarse, close-set punctures for most of its length; costal margin with 0–22 setigerous punctures; membranal suture nearly straight; membrane almost two-fifths hemelytral length.

Propleuron: Surface polished or closely and finely punctured and/or striated, depression usually punctate; prosternal carinae low, obtuse, area between them sunken.

Mesopleuron: Flattened; evaporatorium extensive, reaching posterior and lateral margins of segment, sometimes entire (fig. 109) and sometimes interrupted by posterior, submarginal polished spur extending mesally from lateral area; posterior margin finely crenulate; mesosternum swollen and partly carinate along midline, with a number of long, fine hairs on apical half.

Metapleuron (fig. 109): Flat; evaporatorium reaching about two-thirds across segment; osteolar peritreme extended about half way across evaporatorium, without a differentiated apical structure, osteole opening posteriorly at base of subapical "hook."

Legs: Moderately long; anterior tibia (fig. 123) compressed, not surpassing tarsal insertion, dorsal margin with eight to ten stout, blunt spines; middle tibia stout, somewhat compressed, spines of posteroventral margin longer and more slender than those of dorsal margins; posterior tibia (fig. 142) distinctly compressed, spines restricted to dorsal and ventral margins, those of posteroventral margin longer and more slender than those of dorsal margin; tarsi 3-segmented, II shortest.

Sternites: Polished, with or without rows of setigerous punctures across segments; segmental sutures entire or finely crenulate.

The only nymphal material available was of the common North American species *ciliatus* (*mirabilis* auct., nec Perty). The several specimens involved possessed the submarginal setae on the head, the longer, finer spines on the posteroventral margin of the posterior tibia and the simple second labial segment.

Type of genus.—*Cyrtomenus castaneus* Amyot and Serville (1843, p. 91), subsequently designated by Kirkaldy (1903, p. 230); of *Syllobus*, *Cyrtomenus emarginatus* Stål (1862, p. 95), monobasic. *C. castaneus* belongs to the common *Cyrtomenus* of the southern United States and therefore must fall as a synonym of Palisot de Beauvois' name *ciliatus*, which antedates it by 38 years.

Distribution.—This genus is known to occur only in the Western Hemisphere where its included species range from lat. 40° N. in the eastern United States south and west through Central America to about lat. 35° S. in Argentina in South America.

Discussion.—Stål's species *Cyrtomenus emarginatus*, for which Signoret (1879, p. clxxiii) erected the new genus *Syllobus*, is here being returned to its original assignment to *Cyrtomenus*. This is being done because *emarginatus* shows the same thick-set, convex form, the flattened and somewhat curved posterior tibia with the longer, more slender posteroventral spines, the short osteolar peritreme with a posterior, subapical hook but no differentiated terminal process, and the indicated closer relationship with *teter* whose placement in *Cyrtomenus* has been generally accepted. Signoret apparently based his separation of the two genera chiefly on the triangularly produced apices of the juga. While this is admittedly a conspicuous character in a family of superficially morphologically similar forms, it is hardly of sufficient fundamental value to outweigh the several features which ally *emarginatus* to *Cyrtomenus*.

The species included in this genus as thus understood may easily be arranged in two major groups on the basis of the shape of the mesopleural evaporatorium. In one group, which contains *emarginatus* and the other larger South American species, this evaporatorium i interrupted posteriorly by a submarginal, mesally directed spur from the lateral area which reaches more than half way to medial angle os segment; in the other group the mesopleural evaporatorium is noft interrupted (fig. 109) by such a shining area. If these two groups are recognized as subgenera, as is proposed to be done here, the one with the uninterrupted mesopleural evaporatorium contains the genotype, *castaneus*, and will take the subgeneric name *Cyrtomenus*, while the other will take the name *Syllobus* which had previously been proposed for one of its included species, *emarginatus*.

Key to the subgenera of *Cyrtomenus*

1. Mesopleural evaporatorium posteriorly interrupted by shining, submarginal band . . . . **Syllobus** (p. 517)
2. Mesopleural evaporatorium entire (fig. 109) . . . . . **Cyrtomenus** (p. 525)

Subgenus *Cyrtomenus* (*Syllobus*) Signoret, new status

Syllobus Signoret, 1879, p. clxxiii.

Diagnosis.—This subgenus is best identified by the posterior, submarginal interruption of the mesopleural evaporatorium as described in key to subgenera.

Description.—Size usually larger, 8.99–13.95, but *marginalis* measures only 7.07 (known only from type female). Juga rounded and equalling or surpassing clypeus or triangularly produced apically and contiguous in front of it.

Pronotum: Laterally with 10 to 25 setigerous punctures submarginally; of males with a large, shallow, subapical, somewhat cruciform impression.

Sternites: Polished; submarginal or median rows of setigerous punctures on segments I to III, usually with small or moderate setae arising from them.

Legs: Posterior tibia not or but gradually and little expanded toward apex.

Type of subgenus.—*Cyrtomenus emarginatus* Stål (1862, p. 95), monobasic.

Distribution.—The known range extends from Mexico south through the northeastern part of South America to southern Brazil; this being a more or less central part of the range of the entire genus. The Florida record for *emarginatus* by Torre Bueno (1939) requires confirmation, and at best probably represents only an adventive specimen.

Discussion.—Of the four species belonging to this subgenus, two—*emarginatus* and *marginalis*—are well marked. The former is strongly characterized by the remarkable, triangular projections at the apices of the juga, and *marginalis* by the much more numerous setae on the sides of the pronotum and costa. The other two species, *teter* and *grossus*, are very closely allied to each other, but appear distinct on the basis of external features as well as on the shape of the gonostyli.

Key to species of subgenus *Cyrtomenus* (*Syllobus*)

1. Costa with 20 or more setigerous punctures . . **marginalis** Signoret (p. 521)
   Costa with not more than 10 setigerous punctures 2
2. Apices of juga projecting as blunt to acute triangles (fig. 58).
   emarginatus Stål (p. 518)
   Apices of juga rounded, not projecting triangularly 3

3. Interocular width distinctly greater than length of head; costa not continuing or paralleling outline of lateral margins of pronotum, distinctly more flaring posteriorly . . . . **grossus** Dallas (p. 520)
   Interocular width less than length of head; costa continuing or paralleling outline of lateral margins of pronotum . . . . . **teter** (Spinola) (p. 523)

Cyrtomenus (*Syllobus*) *emarginatus* Stål, revived combination

Plate figures 58, 240

Cyrtomenus emarginatus Stål, 1862, p. 95; 1876, p. 27.—Walker, 1867, p. 147.

Syllobus emarginatus Signoret, 1879, p. clxxiii; 1881b, p. 322, pl. 10, fig. 40.—Distant, 1880, p. 4, pl. 3, fig. 6.—Uhler, 1886, p. 3.—Lethierry and Severin, 1893, p. 64.—Torre Bueno, 1939, p. 177.

Diagnosis.—This species can be recognized not only within this subgenus but among all the Cydnidae of the Western Hemisphere by the triangularly projecting jugal apices (fig. 58).

Description.—Male:

Head: Length more than half width, 1.79(1.62–2.47):2.84(2.60–3.13); interocular width, 1.57(1.49–1.62); anterior outline forming one blunt to acute angulation either side of median emargination (fig. 58); surface polished, jugum with numerous round and elongate punctures; ocelli large, separated from eye by space slightly more than half of transverse ocellar width; jugum ventrally polished, impunctate; maxillary plate with fine punctures and wrinkles. Antennal segments: I, 0.58(0.50–0.70); II, 0.39(0.30–0.50); III, 0.79(0.73–0.86); IV, 0.81(0.63–1.00); V, 0.95(0.83–1.00). Bucculae not more than half as high as labial II; labium reaching between middle coxae. Labial segments: I, 0.92(0.83–1.00); II, 1.49(1.30–1.66); III, 1.39(1.26–1.66); IV, 1.06(0.93–1.20).

Pronotum: Length more than half width, 3.80(3.60–4.20):6.66(6.15–7.35); lateral margin straight on basal third or half, with submarginal row of six to nine setigerous punctures; transverse impression obsolete, marked by irregular, interrupted row of punctures; anterior lobe with very broad, shallow, median, subapical depression; this depression and sides of both lobes with coarse and fine punctures intermixed; posterior lobe with few large punctures medially.

Scutellum: Length little less than width, 4.14(3.76–4.49):4.31(3.90–4.81); impunctate across base and apex, disc with widely scattered, coarse, sunken punctures.

Hemelytron: Clavus and corium polished; clavus with single row of large punctures; mesocorial punctures forming two more or less distinct rows paralleling claval suture, elsewhere with scattered punctures; exocorial punctation more abundant and variable than that of mesocorium; costa with 0–3 setigerous punctures.

Propleuron: Polished, with numerous fine punctures in depression.

Mesopleuron: Evaporatorium interrupted posteriorly by shining submarginal band, lateral area impunctate.

Metapleuron: Lateral margin of evaporatorium distinctly concave; lateral area impunctate.

Legs: Posterior tibia not expanded near apex.

Terminalia: Genital capsule strongly punctate laterally, apical margin with broad, shallow emargination medially; gonostylus as illustrated (fig. 240).

Length of body: 11.91(10.80–13.39).

FEMALE: Similar to male, but lacking median, subapical depression on anterior lobe of pronotum and often with pronotal punctation less dense; measurements averaging larger.

Head: Length-width ratio, 1.84(1.69–1.95):3.13(2.93–3.26); interocular width, 1.71(1.62–1.82). Antennal segments: I, 0.67(0.60–0.73); II, 0.49(0.40–0.53); III, 0.89(0.76–0.96); IV, 0.93(0.80–1.00); V, 1.04(0.96–1.10). Labial segments: I, 1.01(0.93–1.13); II, 1.60 (1.33–1.72); III, 1.62(1.43–1.69); IV, 1.11(1.00–1.23).

Pronotum: Length-width ratio, 4.02(3.57–4.29):6.91(6.28–7.28).

Scutellum: Length-width ratio, 4.28(3.71–4.71):4.55(4.14–4.85).

Length of body: 12.96(11.25–13.95).

TYPE DATA.—Although no locality was specifically cited in the original description, the title of Stål's paper indicated the material had come from Mexico. The type has not been located. It is not with the Stål collection (Stock).

SPECIMENS STUDIED.—14 males, 30 females.

MEXICO: *Veracruz:* Atoyac, Córdoba, Jesús Carranza; May.

GUATEMALA: Morales; August.

BRITISH HONDURAS: Punta Gorda; July.

COSTA RICA: Cairo; April.

FRENCH GUIANA: Mara River (Oyapock River); May.

BRAZIL: Chapada, Monlevade, Rio Madeira, Viçasa (Minas Gerais); May, September.

PERU: Tingo María; May.

ARGENTINA: Coronda (Santa Fé), Urundel (Salta); adults and nymphs, January.

DISCUSSION.—In citing this species as the sole inclusion in his new genus *Syllobus*, Signoret (1879) gave the original combination of this name as "*Cydnus emarginatus* Stal." This was undoubtedly an error as the insect was originally described as a member of the genus *Cyrtomenus*.

Except for an occasional notation of "collected at light," no ecological data were found on any of the specimens. Fifth-instar nymphs show the apical, bluntly triangular projections of the juga characteristic of the adults.

Torre Bueno's (1939) record for Florida needs verification, and may prove to have been based on an adventive.

Cyrtomenus (Syllobus) grossus Dallas

PLATE FIGURE 242

Cyrtomenus grossus Dallas, 1851, p. 111.—Walker, 1867, p. 148.—Stål, 1876, p. 18.—Distant, 1880, p. 2, pl. 2, fig. 14.—Signoret, 1881b, p. 198, pl. 16, fig. 18.—Uhler, 1886, p. 3.—Lethierry and Severin, 1893, p. 62.

DIAGNOSIS.—The very great width of the interocular part of the head, which here is greater than the length of the head, will permit ready recognition of this species within the subgenus.

DESCRIPTION.—Based on one male and two females. MALE: Oval, outline of costa not continuing nor paralleling lateral margins of pronotum but more abruptly flaring posteriorly.

Head: Length more than half width, 1.69:2.79; interocular width, 1.89; surface shining, with faint, radiating rugae and minute, widely scattered punctures; ocelli small to moderate, separated from eye by space nearly or quite equalling twice transverse ocellar width; jugum ventrally and maxillary plate shining, impunctate. Antennal segments: I, 0.61; II, 0.46; III, 0.80; IV, 0.73; V, 0.74. Bucculae about half as high as labial II; labium surpassing posterior coxae, sometimes reaching to sternite IV. Labial segments: I, 1.26; II, 2.06; III, 2.19; IV, 1.63.

Pronotum: Length more than half width, 3.75:6.30; lateral margin straight on basal two-thirds, with submarginal row of twelve setigerous punctures; transverse impression virtually not impressed, marked by very irregular interrupted row of punctures; anterior lobe with intermixed coarse and fine punctures laterally and in subapical band paralleling anterior margin, with broad, shallow basin-like depression over most of middle third; posterior lobe with few minute and fewer coarse punctures scattered irregularly across width.

Scutellum: Length more than width, 4.20:3.91; disc polished, with about half dozen coarse punctures and several fine ones widely scattered.

Hemelytron: Clavus and corium shining; clavus with single row of coarse punctures and several finer scattered ones; mesocorium with one complete and one partial row of punctures paralleling claval suture; punctation elsewhere not dense, absent medially; exocorium less densely punctured than mesocorium; costa with five or six setigerous punctures; membrane distinctly surpassing apex of abdomen.

Propleuron: Polished, with few small punctures in depression.

Mesopleuron: Lateral area with few oblique rugulae.

Metapleuron: Lateral margin of evaporatorium oblique, concave; lateral area impunctate.

Legs: Posterior tibia distinctly compressed, gently widened to apical third.

Sternites: Polished, minutely punctate, with several short rugae in spiracular area.

Terminalia: Genital capsule shining, irregularly punctate, more densely so laterally, apical margin slightly concave either side of small, median angulation; gonostylus as illustrated (fig. 242).

Length of body: 10.71.

FEMALE: Similar to male but differing in less distinct subapical impression on pronotum, more distinct rugae on head, and more uniform punctation on apical two-thirds of corium.

Head: Length-width ratio, 1.93(1.91–1.95):2.91(2.86–2.96); interocular width, 2.02(2.02–2.02). Antennal segments: I, 0.61(0.60–0.62); II, 0.52(0.50–0.55); III, 0.73(0.67–0.80); IV, 0.71(0.70–0.73); V, 0.81(0.80–0.83). Labial segments: I, 1.19(1.16–1.23); II, 1.87(1.86–1.89); III, 2.27(2.12–2.42); IV, 1.64(1.56–1.72).

Pronotum: Length-width ratio, 3.75(3.75–3.75):6.30(6.28–6.32).

Scutellum: Length-width ratio, 4.86(4.80–4.92):3.90(3.90–3.91).

Length of body: 11.03(10.90–11.08).

TYPE DATA.—Dallas described the type (BrM) as being from "Columbia [!]."

SPECIMENS STUDIED.—1 male, 2 females.

MEXICO: *Chiapas:* Volcán de Tacaná, 9,100 feet, Mar. 30, 1939, P. Brodkorb, 1 female (MMZ).

GUATEMALA: Purulhá, May 16, 1 female (USNM).

ECUADOR: El Topo, Oct. 5, 1944, E. J. Hambleton, 1 male (USNM).

DISCUSSION.—Notes based on the type and furnished by Dr. W. E. China in correspondence has enabled the author to associate Dallas' name with this form. *C. grossus* and *C. teter* are rather closely allied to each other but separate easily from the other two forms in the subgenus as indicated in the key. From each other, these forms may be best separated by the head and costal characters listed in the key, but in addition one may often use the greatly elongated labium, which in *grossus* always reaches sternite IV and in *teter* seldom surpasses the posterior coxae.

Cyrtomenus (*Syllobus*) *marginalis* Signoret

Crytomenus marginalis Signoret, 1881b, p. 201, pl. 6, fig. 21.—Lethierry and Severin, 1893, p. 62.

DIAGNOSIS.—The elongate second antennal segment, which is here equal in length to the third, or the large number of setigerous punctures in lateral submarginal row on the pronotum, or the numerous setigerous punctures on the costa will separate *marginalis* from all other members of the genus.

Description.—Based on one specimen seen, the type female.

Head: Length more than half width, 1.23:1.82; interocular width, 1.04; anterior outline broadly semicircular, juga longer than clypeus, converging and contiguous above its apex; eyes projecting beyond outline of head by about half transverse diameter; surface shining, jugum with prominent radiating rugae and numerous close-set, intermixed moderate and fine punctures; ocelli large, separated from eye by space about half transverse ocellar width; jugum ventrally smooth, impunctate; maxillary plate alutaceous, with irregular, coarse punctures posteriorly. Antennal segments: I, 0.36; II, 0.43; III, 0.43; IV and V missing. Bucculae not as high as labial II; labium broken, only first segment present (0.56).

Pronotum: With posterior margin partly broken, length more than half width, 2.42:4.19; lateral margin weakly arcuate from base to apical fourth, thence more abruptly incurved, with submarginal row of 25 setigerous punctures; transverse impression weak, with moderate punctures similar to and merging with punctation across entire anterior half of posterior lobe; latter with minute, widely scattered punctures on posterior half; anterior lobe with broad submarginal band apically and broader submarginal band laterally and narrower midline with punctures similar to those of transverse impression, subapical band with minute punctures interspersed.

Scutellum: Length less than width, 2.56:2.71; discal punctures irregular, much denser than those of mesocorium, slightly more abundant laterally but not arranged in single, regular series; apex shining, impunctate.

Hemelytron: Shining, clavus with several incomplete rows of punctures; mesocorium and exocorium with several widely spaced, moderate punctures; costa with 21 to 23 setigerous punctures.

Mesopleuron: Lateral area with few longitudinal rugae.

Sternites: All, except ultimate, roughened laterally, with irregular postmedian row of prominent setigerous punctures.

Length of body: 7.07.

Type data.—Signoret's type specimen (Wien) is a female. Although the original description gave no locality, personal examination of the type showed it to bear two labels, "Brazil, Coll. Signoret," and Signoret's determination "marginal."

Specimen studied: The type from Brazil. Distant (1899) accredited Dallas' (1851) record of *Aethus ciliatus* from Colombia to this strongly marked species. However, Dr. China informed the author that Dallas' specimen has only seven costal setigerous punctures, thus preventing acceptance of Distant's conclusions.

Discussion.—Signoret's type specimen is in fair condition but lacks antennals IV and V, labials III and IV, the apex of II (dermestid

damage?) and all tarsi, and the pronotum is fractured. In the original description the equality of antennals II and III was noted. This is an unusual feature within the genus and would suggest that the species had not been properly placed. However, the type not only shows the antennal condition as described by Signoret, but also has the general shape and osteolar and leg modifications of *Cyrtomenus*, thereby confirming the generic assignment.

Cyrtomenus (*Syllobus*) *teter* (Spinola)

Plate figure 241

Cydnus teter Spinola, 1837, p. 332.
Cyrtomenus teter Dallas, 1851, p. 111.—Walker, 1867, p. 147.—Stål, 1876, p. 18.—Distant, 1880, p. 2, pl. 2, fig. 12.—Signoret, 1881b, p. 197, pl. 6, fig. 17.—Uhler, 1886, p. 3.—Van Duzee, 1917, p. 18.—Torre Bueno, 1939, p. 177.
Cyrtomenus excavatus Distant, 1880, p. 2, pl. 2, fig. 13.

Diagnosis.—This species may be recognized by a combination of three features: regularly rounded outline of head, less than 10 setigerous punctures on costa, and the short labium which does not surpass or only very slightly surpasses the posterior coxae.

Description.—Male:

Head: Length more than half width, 1.79(1.69–1.91):2.63(2.60–2.70); interocular width, 1.68(1.56–1.75); anterior outline a flattened semicircle, clypeus nearly or quite as long as juga, moderately to strongly narrowed apically; surface shining, with faint to moderate, radiating rugae, punctation fine or absent; ocelli large, separated from eye by space slightly greater than transverse ocellar width; jugum ventrally and maxillary plate shining, impunctate. Antennal segments: I, 0.56(0.51–0.60); II, 0.41(0.36–0.45); III, 0.67(0.66–0.70); IV, 0.72(0.70–0.73); V, 0.71(0.70–0.73). Bucculae low, about half as high as labial II; labium reaching between or slightly beyond posterior coxae. Labial segments: I, 1.10(1.01–1.16); II, 1.59(1.50–1.66); III, 1.66(1.60–1.69); IV, 1.34(1.23–1.40).

Pronotum: Length more than half width, 3.66(3.31–3.83):6.15(5.70–6.27); lateral margin with 16 to 18 setigerous punctures submarginally; transverse impression more strongly impressed laterally than medially, marked with irregular, medially interrupted row of coarse punctures; anterior lobe impunctate except for few punctures laterally and irregular, transverse row of coarse punctures subapically; posterior lobe polished, with few widely scattered punctures.

Scutellum: Length subequal to width, 4.13(4.05–4.20):4.12(4.05–4.19); disc impunctate or with few widely scattered punctures.

Hemelytron: Clavus and corium polished; clavus with one complete row of punctures, sometimes also with several scattered punctures; mesocorium with two rows of punctures paralleling claval suture,

outer row usually interrupted medially, elsewhere closely punctate; exocorium with punctation much sparser than on mesocorium; costa with five to seven setigerous punctures; membrane distinctly surpassing apex of abdomen.

Propleuron: Shining, with few small punctures in depression.

Mesopleuron: Lateral area impunctate, obliquely rugulose.

Metapleuron: Lateral area impunctate.

Legs: Posterior tibia distinctly compressed, not expanding toward apex.

Sternites: Polished, minutely punctate.

Terminalia: Genital capsule polished, irregularly punctate, more densely so laterally; apical margin slightly concave either side of small, median angulation; gonostylus as illustrated (fig. 241).

Length of body: 11.19(10.36–11.55).

Female: Similar to male except that subapical pronotal impression is greatly reduced and scutellum is usually longer than wide.

Head: Length-width ratio, 1.76(1.49–1.95):2.61 (2.34–2.76); interocular width, 1.63(1.56–1.75). Antennal segments: I, 0.57(0.53–0.63); II, 0.40(0.36–0.43); III, 0.68(0.63–0.73); IV, 0·68(0.63–0.73); V, 0.71(0.70–0.73). Labial segments: I, 1.16(1.06–1.26); II, 1.65(1.56–1.69); III, 1.75(1.60–2.06); IV, 1.35(1.23–1.56).

Pronotum: Length-width ratio, 3.46(2.73–3.75):5.91(5.17–6.29).

Scutellum: Length-width ratio, 4.05(3.58–4.34):3.78(3.78–4.05).

Length of body: 10.15(8.99–10.85).

Type data.—The type specimen of *teter* Spinola, whose present location has not yet been ascertained, had been reported as coming from "Brezil." The type (BrM) of Distant's *Cyrtomenus excavatus* was described from "Costa Rica, Irazu."

Specimens studied.—11 males, 35 females.

Guatemala: Cobán; July.

Costa Rica: Pacayas, San Lucas.

Panama: El Volcán (Chiriquí), Potrerillos; February, May.

Brazil: Espírito-Santo, Nova Teutonia, Rio Natal (Santa Catarina), Rio Negro (Paraná), Rio Verelho (Santa Catarina), Santa Cruz, São Paulo, Serra das Orgãos, Therezópolis, Viçosa; September to February.

Discussion.—Although the type was not studied in connection with the present work, there appears to be no reason to disagree with the unanimous association of Spinola's name with the present form. In the original description of *excavatus*, Distant enumerated certain differences between his supposed new species and *teter*, but these differences were simply sexual, Distant having redescribed the male under a new name. None of the specimens examined bore any comments as to the conditions under which it had been captured.

Subgenus *Cyrtomenus* (*Cyrtomenus*) Amyot and Serville

Cyrtomenus Amyot and Serville, 1843, p. 90.

Diagnosis.—The uninterrupted mesopleural evaporatorium will satisfactorily distinguish this subgenus from *Syllobus*.

Description.—Size moderate; length of body, 6.4–8.6.

Head: Juga rounded, equalling, longer than, or surpassing clypeus and contiguous at apex of clypeus.

Pronotum: Laterally with 4 to 12 setigerous punctures; males and females usually with similar, vague, subapical, median impression.

Sternites: Polished; I and II and sometimes others with submarginal row of setigerous punctures giving rise to long, golden setae.

Legs: Posterior tibia moderately to strongly compressed and often strongly expanded in apical third.

Type of subgenus.—*Cyrtomenus castaneus* Amyot and Serville (1843, p. 91), subsequently designated by Kirkaldy (1903, p. 230). This name is here considered as a synonym of *Pentatoma ciliata* Palisot de Beauvois which becomes *Cyrtomenus ciliatus* (Palisot de Beauvois) as the proper name for the common North American species which has long but erroneously gone under the name "*Cyrtomenus mirabilis* (Perty)." A lengthier discussion of this problem is presented under *C. ciliatus* (p. 532).

Distribution.—The species of this subgenus occupy the area from eastern and central United States south through Central America and the West Indies into South America to central Argentina; i.e., the full range of the genus.

Discussion.—The four species of this subgenus can be grouped in several ways by different sets of characters. If just the degree of dilation of the posterior tibia is considered (which may have significance in burrowing forms), the two very closely allied North American species separate from the other two, as follows:

Posterior tibia as broad as anterior tibia:	*ciliatus* (Palisot de Beauvois) *crassus* Walker
Posterior tibia narrower than anterior tibia:	*mirabilis* (Perty) *bergi*, new name

But if the greater convexity of the body, the more strongly rugose head and the larger ocelli are contrasted with the less convex body, the flatter, smoother head, and the smaller ocelli, the arrangement would be like this:

Greater convexity; rugose head; large ocelli:	*ciliatus* (Palisot de Beauvois) *crassus* Walker *mirabilis* (Perty)
Less convex; smoother head; small ocelli:	*bergi*, new name

A grouping similar to the one based on the degree of dilation of the posterior tibia is possible if reference is made to the presence or absence of a postmedian, partial row of prominent setigerous punctures on the lateral third of sternites IV to VI, as indicated in the following couplet:

With setigerous punctures on lateral third of sternites IV to VI:	*ciliatus* (Palisot de Beauvois)
	crassus Walker
Without such setigerous punctures:	*mirabilis* (Perty)
	bergi, new name

One notices immediately that *mirabilis* is the form that shifts position in these various associations. Obviously, it is not an extreme form, but probably occupies a somewhat intermediate position. In habitus it appears closest to the two North American forms, but is separated from them on the absence of setigerous punctures on the lateral third sternites IV to VI and the less expanded hind tibia. The latter feature should not be passed over too lightly, because if one of the directions of evolution within the Cydnidae is towards greater efficiency of digging (which seems logical in view of what is known of the ecology of the group) the more strongly dilated posterior tibiae should have some significance within this subgenus.

Key to species of the subgenus *Cyrtomenus* (*Cyrtomenus*)

1. Sternites IV to VI with postmedian, partial, transverse row of prominent setigerous punctures on lateral third; posterior tibia strongly compressed, its greatest diameter nearly or quite equal to that of anterior tibia . . . 2

   Sternites IV to VI without a transverse row of prominent setigerous punctures on lateral third; posterior tibia weakly to moderately compressed, greatest diameter not more than two-thirds that of anterior tibia 3

2. Outline [8] of juga rounded, tending to be somewhat triangular (fig. 56); about one-half width of eye projecting laterally beyond posterolateral angle of jugum. . . . . **ciliatus** (Palisot de Beauvois) (p. 530)

   Outline of juga verybr oadly rounded and reflexed (fig. 57); about one-third of eye projecting laterally beyond posterolateral angle of jugum.
   crassus Walker (p. 533)

3. Space separating ocellus from eye less than transverse ocellar width (12:20); surface of head distinctly convex, with coarse, radiating rugae
   mirabilis (Perty) (p. 536)

   Space separating ocellus from eye slightly more than transverse ocellar width (18:15); surface of head nearly smooth, almost without rugae
   bergi, new name (p. 527)

[8] NOTE: When using this feature, one is cautioned to determine the amount of wear on the margin of the head by noticing the position of the margin of the head in relation to the submarginal row of setigerous punctures. This character may be negated by such wear. During the present study, it has been noticed that there appears to be a direct correlation between the amount of wear on the margin of the head and that shown by the dorsal margin of the anterior tibia. In extreme cases, even the tubercles that give rise to the dorsal spines of the anterior tibia may be completely abraded away. Such a situation may be used as a check for the amount of wear on the margin of the head.

Cyrtomenus (*Cyrtomenus*) *bergi*, new name

PLATE FIGURE 243

Cyrtomenus ciliatus Berg, 1879, p. 10 (nec Palisot de Beauvois, 1805, p. 186).

DIAGNOSIS.—The smaller ocelli which are separted from the eyes by a space slightly greater than a transverse ocellar width or the absence of strong rugae on the head will mark this species as distinct from the other three in the subgenus.

DESCRIPTION.—MALE: Head: Length more than half width, 1.45 (1.11–1.62):2.08(1.71–2.47); interocular width, 1.34(1.10–1.56); anterior outline nearly or quite a full semicircle, juga surpassing and converging or contiguous in front of clypeus; surface polished, with weak to obsolete, radiating rugae, impunctate, with minute punctures or with few distinct punctures anterior to ocelli; ocelli small to moderate, separated from eye by space little greater than transverse ocellar width; jugum ventrally weakly alutaceous, sometimes with few small punctures; maxillary plate strongly alutaceous and with crowded punctures. Antennal segments: I, 0.47(0.34–0.63); II, 0.27(0.20–0.43); III, 0.47(0.35–0.63); IV, 0.47(0.40–0.53); V, 0.49(0.46–0.90). Bucculae about half as high as labial II; labium slightly surpassing apices of intermediate coxae. Labial segments: I, 0.78(0.53–1.06); II, 1.02(0.70–1.40); III, 1.02(0.70–1.46); IV, 0.77(0.57–1.03).

Pronotum: Length more than half width, 2.58(1.82–3.00):4.63 (3.57–5.46); lateral margins straight on basal half, with submarginal row of 15 to 20 setigerous punctures; transverse impression weakly to moderately impressed, obsolete or absent at middle, marked by irregular, interrupted row of coarse punctures; anterior lobe with weak subapical impression, with several coarse punctures laterally and in subapical band; posterior lobe with few to many coarse scattered punctures medially.

Scutellum: Length less than width, 3.01(2.26–3.60):3.07(2.25–3.73); disc with widely scattered, sunken, coarse punctures.

Hemelytron: Clavus and corium polished; clavus with one row of punctures medially; mesocorial punctures arranged in two rows paralleling claval suture, outer row often incomplete, discal punctures numerous, well-separated, often absent along radial vein; exocorium usually more sparsely punctate than mesocorium; costa with six to eight setigerous punctures; membrane distinctly surpassing apex of abdomen.

Propleuron: Variable, from polished and impunctate to roughened by crowded, fine, longitudinal rugulae and small punctures.

Mesopleuron: Lateral area shining, impunctate, with few oblique rugae.

Metapleuron: Lateral area polished, impunctate.

Legs: Posterior tibia compressed, very weakly expanded toward apex, greatest diameter much less than that of anterior tibia.

Sternites: Polished, virtually impunctate except among longitudinal rugae in spiracular area.

Terminalia: Genital capsule polished, with several distinct punctures laterally, apical margin virtually straight; gonostylus as illustrated (fig. 243).

Length of body: 7.32(6.17–9.40).

Female: Similar to male, anterior pronotal lobe without median, subapical impression.

Head: Length-width ratio, 1.42(1.30–1.62):2.07(1.82–2.47); interocular width, 1.34(1.23–1.52). Antennal segments: I, 0.45(0.40–0.53): II, 0.28(0.23–0.34); III, 0.47(0.40–0.56); IV, 0.46(0.40–0.56); V, 0.51(0.46–0.60). Labial segments: I, 0.75(0.66–1.00); II, 1.05(0.86–1.50); III, 1.00(0.83–1.66); IV, 0.78(0.68–1.13).

Pronotum: Length-width ratio, 2.37(2.11–2.84):4.34(3.90–5.02).

Scutellum: Length-width ratio, 2.71(2.54–3.45):2.81(2.54–3.13).

Length of body: 7.41(6.72–9.00).

Type data.—The type specimen of *Cyrtomenus bergi*, since it is proposed as a new name for the preoccupied *Cyrtomenus ciliatus* of Berg, not of Palisot de Beauvois (1805, p. 186), must be the same as that which served as the type for Berg's name. That specimen was cited in the original description as having come from "Provincia Bonaerensis," Argentina. Unfortunately, this type, as well as many of Berg's other types, appears to be lost, but in its absence this author is accepting a female specimen in the Signoret collection (Wien) as indicative of Berg's concept of this form; it is labeled "Cordoba" and "*Cyrtomenus ciliatus* det. Berg."

Specimens studied.—83 males, 171 females.

Mexico: *San Luis Potosí:* Tamazunchale; May. *Tabasco:* Fontera; June. *Veracruz:* Orizaba. *Yucután:* Colonia Yucután; August.

Guatemala: Champerico, Morales; January, May.

Nicaragua: Managua.

Costa Rica: San José, Turrialba; March, July.

Panama: *Canal Zone:* Barro Colorado Island; May.

Grenada: Leeward side.

Trinidad: Port of Spain, St. Augustine; January.

Colombia: Río Guayuriba (Meta); December.

Venezuela: Boquerón, Caracas, Tachira; June, October.

British Guiana: Kartabo; June.

Surinam: "Surinam."

Brazil: Bahia, Chapada, Distrito Federal, Espírito Santo, Independencia, Nova Teutonia, Pará, Pernambuco, Rio de Janeiro, Rio Grande du Sol, Sabará, Belo Horizonte, San Mauro, Santarém, São Paulo, Taperina, Viçosa; June, October to March.

Peru: Achinamiza, Chanchosmayo, Iquitos, Río Pampas, Tingo María; January to May.

Bolivia: Coroico, Ñuflo de Chavez, Puerto Suárez, Provincia de Sará, Río Cristalmayo (50 miles northeast of Cochabamba), Rurrenabaque (Beni), Santa Cruz de la Sierra, Tiguipa; April, October to December.

Paraguay: Asunción, Horqueta, Villarrica; May, September to December.

Argentina: Alta García, Córdoba, La Plata, Rosario, Tucumán; January, May, October.

Discussion.—Ever since Signoret (1881a) suggested that *Cyrtomenus ciliatus* Berg was the same species as another *Cyrtomenus* described by Palisot de Beauvois (1805) as *Pentatoma ciliata*, authors have accepted this placement. Examinations of the original descriptions indicate that such a position is untenable. First of all, the two forms were described from widely separated localities. Palisot de Beauvois gave his type locality as "Etats-Unis d'Amerique," while Berg described his specimen as being from "Provincia Bonaerensis," Argentina. Since no species of the genus *Cyrtomenus* is known to occur in both of these places one doubts Signoret's conclusions. Secondly, Berg described his species as having the head "subrugose," a statement that can scarcely fit the species known from the United States. As the two forms thus appear to be distinct, Palisot de Beauvois' name cannot be used for a South American form as was done by Signoret, but must be reserved for a northern species, i.e., one from the United States. In the present paper Palisot de Beauvois' name is assigned to the common *Cyrtomenus* of the southern United States, the one that has long gone under the name *mirabilis* of authors but not of Perty. Further discussion of this point will be found under the name *Cyrtomenus ciliatus*.

Even though *ciliatus* Berg is not a synonym of *ciliatus* Palisot de Beauvois, it is a junior homonym and so must receive a new name. The new name *bergi* is here proposed.

C. bergi, whether a single species or a species complex, presents a real problem because of its very extensive distribution and great amount of variability in several features which appear to grade from one extreme to another. This variability was most conspicuous in four characters, as follows:

(1) The length of the body varied from 6.17 to 9.40, with the larger specimens mostly from the more northern localities and appearing (maybe deceptively so) slightly more robust. As yet, this cannot be indicated in a definitive way and so is not followed further.

(2) Measurements indicated that the segments of the labium were the most variable structures, not only in the actual measurements but also in proportions. Unfortunately, these measurements and proportions showed no discontinuity that could be relied upon for separations.

(3) Dorsal punctation was moderately uniform throughout the series except that toward the sides of the pronotum, especially of the anterior lobe. Ventrally, surface sculpture offered little help for separating characters except on the propleuras. For some time one group of specimens was separated from all the others

on the basis of the propleural sculpture. These specimens had the anterior propleural convexity distinctly dulled by prominent alutaceousness and often longitudinal striae and fine punctures, and the depression and posterior convexity coarsely, transversely striated and often with coarse punctures. This worked very satisfactorily in contrast to the other extreme of highly polished surfaces. But study of additional specimens found so many intermediates that repeated separations of the same material on these characters rarely resulted in the same placement of any but the extremes.

(4) The male gonostyli also offered some variability which, on the basis of the several specimens studied for this structure, was gradual rather than discontinuous and so could not be used for a separating feature.

Besides the usual occasional specimen with the comment "collected at light," there was in the material studied a sizable series of unusually small specimens from Surinam labeled "in coffee field," and one specimen from Venezuela with the note "on potato."

***Cyrtomenus* (*Cyrtomenus*) *ciliatus* (Palisot de Beauvois), new status**

PLATE FIGURES 10, 34, 56, 109, 123, 142, 244

Pentatoma ciliata Palisot de Beauvois, 1805, p. 186, pl. 11, fig. 6.

Cyrtomenus castaneus Amyot and Serville, 1843, p. 91.—Walker, 1867, p. 147.—Stål, 1876, p. 18.

Cydnus ciliatus Amyot and Serville, 1843, p. 62.

Cyrtomenus mutabilis Walker, 1867, p. 147 (part).—Uhler, 1877, p. 367 (part).

Pentatoma ciliata "loc. incert." Stål, 1876, p. 26.

Cyrtomenus ciliatus Berg, 1879, p. 9 (part).

Cyrtomenus mirabilis Berg, 1879, p. 9 (part).—Distant, 1880, p. 3 (part).—Signoret, 1881b, p. 199 (part, not figure).—Uhler, 1886, p. 3.—Lethierry and Severin, 1893, p. 62 (part).—Banks, 1910, p. 99.—Van Duzee, 1917, p. 18 (part).—Torre Bueno, 1939, p. 177.

DIAGNOSIS.—The strongly compressed posterior tibia whose width equals that of the anterior tibia marks this species from all its congeners except *crassus* Walker. From *crassus* it is distinguished by the less broadly rounded anterior outline of the head and the more strongly projecting eyes (figs. 56, 57).

DESCRIPTION.—MALE:

Head: Length more than half width, 1.44(1.30–1.56):2.12(1.95–2.28); interocular width, 1.28(1.23–1.36); anterior outline (fig. 56) somewhat triangular, juga slightly longer than clypeus and convergent beyond it; eyes projecting by about one-half their width; surface decidedly convex, shining, with prominent coarse rugae radiating from base of clypeus, minutely punctate; ocelli very large, separated from eye by space about half transverse ocellar width; jugum ventrally shining, partly rugulose; maxillary plate alutaceous, with numerous distinct punctures. Antennal segments: I, 0.40(0.36–0.43); II, 0.29(0.26–0.31); III, 0.44(0.40–0.48); IV, 0.46(0.43–0.50); V, 0.48(0.46–0.50). Bucculae less than half as high as labial II,

labium reaching between posterior coxae. Labial segments: I, 0.83(0.73–0.96); II, 1.11(0.93–1.23); III, 1.06(0.93–1.16); IV, 0.91(0.83–1.00).

Pronotum: Length more than half width, 2.65(2.58–2.85):4.56(4.41–5.10); lateral margins straight on basal two-thirds, with submarginal row of 12 to 14 setigerous punctures; transverse impression moderately impressed, marked by rather regular, medially interrupted row of coarse punctures; anterior lobe with broad, shallow, subapical impression, with punctures confined to subapical band and lateral patch; posterior lobe with several coarse punctures medially and few others scattered elsewhere.

Scutellum: Length subequal to, slightly less than, or slightly more than width, 3.23(3.15–3.45):3.13(2.86–3.31); disc with few to several widely scattered, coarse, sunken punctures.

Hemelytron: Clavus and corium polished; clavus with one submedian row of punctures; mesocorial punctation moderate, abundant except along radial vein, forming two rows paralleling claval suture, outer one usually incomplete; costa with six to eight setigerous punctures; membrane distinctly surpassing apex of abdomen.

Propleuron: Shining, with few fine punctures laterad of acetabulum and few coarse punctures in depression.

Mesopleuron (fig. 109): Lateral margin of evaporatorium bisinuate; lateral area shining, impunctate.

Legs: Posterior tibia (fig. 142) with greatest diameter equalling that of anterior tibia (fig. 123), latter with seven or eight stout, flattened, blunt spines arising from blackened elevations on dorsal margin.

Sternites: Shining, polished or faintly alutaceous, rugulose in spiracular area; setigerous punctures on III to VIII prominent, with long setae.

Terminalia: Genital capsule shining, with scattered fine punctures; gonostylus as illustrated (fig. 244).

Length of body: 7.63(6.73–7.94).

Female: Very similar to male in shape, punctation, and subapical pronotal impression; measurements somewhat larger, especially of labial segment II.

Head: Length-width ratio, 1.49(1.43–1.56):2.16(2.08–2.24); interocular width, 1.33(1.23–1.43). Antennal segments: I, 0.41(0.36–0.46); II, 0.28(0.23–0.33); III, 0.45(0.43–0.50); IV, 0.40(0.38–0.43); V, 0.47(0.40–0.53). Labial segments: I, 0.90(0.83–1.00); II, 1.21 (1.13–1.33); III, 1.07(1.03–1.13); IV, 0.97(0.93–1.04).

Pronotum: Length-width ratio, 2.75(2.71–2.97):4.76(4.46–5.09).

Scutellum: Length-width ratio, 3.29(3.14–3.45):3.30(3.30–3.30).

Length of body: 7.75(7.33–7.97).

Type data.—The author has been unable to locate Palisot de Beauvois' type which was from "Etats-Unis d'Amerique." Amyot and Serville's type of *castaneus*, also unlocated, was from "Amerique Septentrionale."

Specimens studied: 96 males, 119 females.

United States: *Alabama:* Mobile; June. *Delaware:* Newark; July. *Florida:* Branford, Clearwater, Dunnellon, Fort Lauderdale, Fort Myers, Fruitville, Gainesville, Indian River, Jackson, La Belle, Lacoochee, Lake City, Lakeland, Lake Placid, Lutz, Macclenny, Miami, Putnam Co., St. Petersburg, Sanford, Suwannee Springs, Tallahassee; April to November. *Georgia:* Bainbridge, Hunter Field, Okefenokee Swamp, Thomasville, Waycross; June to September. *Illinois:* Cairo, Harrisburg; June to September. *Kansas:* Ellsworth; September. *Louisiana:* Harahan; July. *Mississippi:* Gulfport, Lucedale; June, November. *Missouri:* Charleston, Kansas City, St. Louis; June to August. *New Jersey:* Manahawkin; August. *North Carolina:* Southern Pines; July. *Oklahoma:* Elmer, Payne Co.; July, August. *South Carolina:* Allendale, Charleston, Florence, Fort Royal; July. *Texas:* Brazos Co., Burkburnett, Colorado City, Columbus, El Paso, Hidalgo Co., Sherman, Sequin; May to August. *Virginia:* Virginia Beach; August.

Discussion.—This species has long gone under the name *mirabilis* Perty (the earlier usage of the spelling *mutabilis* appears to be due to an error on the caption of the plate accompanying the original description). However, the larger size (8.9 mm.) and the type locality "Provincia Piauhiensis," Brazil, indicate that this name has been improperly applied by most authors and actually belongs to a larger South American species of the genus. The earliest published name assignable to this genus, *ciliata* Palisot Beauvois, appears to be the correct one for the present species. The type locality, "Etats-Unis d'Amerique," and the illustration of a stout, compact body 7 mm. long agree well with the species at hand and could belong to no other form except possibly *crassus* Walker. *C. crassus*, however, occurs only in the southwestern part of the continent, an area that did not belong to the United States in the early 1800's. The synonymy also includes the *Cyrtomenus castaneus* of Amyot and Serville, a name which also probably belongs to this species as has been indicated by Uhler (1877) and others.

The relationship between *Cyrtomenus ciliatus*, *crassus* and *mirabilis* (in the sense of the present paper) is not yet fully evident. That there is close morphological relationship between them is observable. Also, their respective ranges are separate, yet adjacent and form a north-south sequence from central North America to southern South America. Such evidence suggests that perhaps these forms do not represent three distinct species, but subspecies of one widely ranging form. If the discontinuities disappear with the examination of additional material from the critical regions, a clinal development of but one form would result, and that form would have to take the name

ciliatus as that is the oldest one applied to any member of the group. At present, however, the author believes that our knowledge of these forms, as well as most of the rest of the family, is so fragmentary that application of the "new systematics" should definitely await the accumulation of more material and more intensive revisions.

An additional feature that may be used to separate *ciliatus* from *crassus* is the presence of more stout, blunt spines on the dorsal margin of the anterior tibia of the latter form. In the specimens of *ciliatus* examined, none showed more than seven or eight of these blunt spines, but they often showed tapering spines based of the series. These latter may make interpretation of this feature difficult until a little experience is gained, as *crassus* shows nine or ten blunt spines. With some experience, however, one can learn to recognize the greater space between the spines, especially on the apical third, as it occurs on the tibia of *ciliatus* (fig. 123). In *crassus* the spines of the same region are more numerous and closely spaced.

Collecting notes and field experience indicate that *ciliatus* is a species of sandy areas and that it frequently comes to light after dark. One specimen from Louisiana bore the label, "with sweet potato." Another small collection of adults and nymphs was noted on "chufa" in Mississippi; and Hart (1919, p. 205) reported nymphs and adults "from Georgia as injurious to the chufa, or edible sedge-root (*Cyperus esculentus* L.)."

The several nymphs seen belonged to later instars and all showed the typical hind tibia, the convex, coarsely rugose head, and the submarginal row of spines on the head which are characteristic of the adults.

Cyrtomenus (*Cyrtomenus*) *crassus* Walker, new status

PLATE FIGURES 57, 245

Cyrtomenus crassus Walker, 1867, p. 147.
Cyrtomenus obtusus Uhler, 1877, p. 369. New synonymy.
Cyrtomenus mirabilis Distant, 1880, p. 3 (part).—Signoret, 1881b, p. 199 (part, not figure).—Uhler, 1886, p. 3 (part).—Van Duzee, 1917, p. 18 (part).
Cyrtomenus castaneus Lethierry and Severin, 1893, p. 62.
Cyrtomenus vestigiatus Distant, 1903, p. 525. New synonymy.

DIAGNOSIS.—The very broadly rounded anteocular part of the head beyond which the eyes project only slightly (fig. 57) added to the presence of a postmedian row of setigerous punctures on lateral third of sternites IV to VI will separate this species from all others in the subgenus.

DESCRIPTION.—MALE:

Head: Length more than half width, 1.50(1.43–1.62):2.20(2.08–2.36); interocular width, 1.37(1.30–1.49); anterior outline very broadly

rounded (fig. 57), eyes projecting beyond sides of head by not more than one-third their width, juga longer than clypeus and nearly or quite contiguous in front of it; apices of juga and clypeus broadly recurved; surface noticeably convex, shining, with prominent, coarse, irregular rugae radiating from base of clypeus, minutely punctate; ocelli large, separated from eye by space slightly more than half transverse ocellar width; jugum ventrally shining, in part obsoletely rugulose; maxillary plate alutaceous, with numerous shallow punctures. Antennal segments: I, 0.44(0.43–0.46); II, 0.30(0.30–0.33); III, 0.47(0.43–0.50); IV, 0.45(0.40–0.50); V, 0.47(0.46–0.50). Bucculae less than half as high as labial II; labium reaching between posterior coxae. Labial segments: I, 0.89(0.86–0.99); II, 1.21(1.13–1.33); III, 1.06(0.96–1.16); IV, 0.87(0.83–0.94).

Pronotum: Length more than half width, 2.83(2.69–3.00):5.01 (4.81–5.40); lateral margin straight to slightly concave on basal two-thirds, with submarginal row of 15 to 18 setigerous punctures; transverse impression distinct laterally, obsolete medially, with medially interrupted, irregular row of coarse, close-set punctures; anterior lobe impunctate except for moderate punctures laterally and in subapical band, median subapical impression broad, very shallow; posterior lobe with several coarse punctures anteriorly, these more numerous medially.

Scutellum: Length subequal to, slightly longer or shorter than width, 3.30(3.15–3.60):3.33(3.14–3.71); disc with few to several widely scattered, coarse, sunken punctures.

Hemelytron: Clavus and corium shining; clavus with one submedian row of punctures; mesocorial punctation forming two rows (outer one incomplete) paralleling claval suture, elsewhere, except along radial vein, uniformly punctate; exocorium more irregularly and less densely punctate than mesocorium; costa with six to ten setigerous punctures; membrane distinctly surpassing apex of abdomen.

Propleuron: Shining, with few distinct punctures in depression.

Mesopleuron: Lateral area polished, impunctate, with few oblique rugulae.

Metapleuron: Lateral margin of evaporatorium more or less concave; lateral area polished, impunctate.

Legs: Posterior tibia (as in fig. 142) strongly dilated toward apex, greatest diameter there equal to that of anterior tibia; latter with nine or ten stout, flattened, blunt spines arising from blackened elevations on dorsal margin.

Sternites: Shining, polished or faintly alutaceous, rugulose in spiracular area; setigerous punctures on segments III to VII prominent, with long setae.

Terminalia: Genital segment shining, with scattered fine punctures, apical margin straight; gonostylus as illustrated (fig. 245).

Length of body: 8.17(7.93–8.66).

FEMALE: Similar to male.

Head: Length-width ratio, 1.51(1.43–1.62):2.31(2.21–2.37); interocular width, 1.41(1.36–1.49). Antennal segments: I, 0.44(0.43–0.46); II, 0.30(0.26–0.33); III, 0.51(0.50–0.53); IV, 0.49(0.43–0.53); V, 0.49(0.43–0.53). Labial segments: I, 0.91(0.86–0.96); II, 1.23 (1.20–1.30); III, 1.07(1.00–1.16); IV, 0.91(0.83–1.00).

Pronotum: Length-width ratio, 2.97(2.84–3.02):5.21(5.10–5.38).

Scutellum: Length-width ratio, 3.53(3.44–3.60):3.58(3.42–3.61).

Length of body: 8.67(8.40–8.98).

TYPE DATA.—Walker's type (BrM) is from Veracruz, Mexico. *C. obtusus* (types in USNM) was described by Uhler from "Texas, Arizona, and perhaps the same as that from Cape Saint Lucas, Lower California." Distant's *vestigiatus* (type in BrM) was described from San Jose, Costa Rica.

SPECIMENS STUDIED.—53 males, 71 females.

UNITED STATES: *Arizona:* Baboquivari Mts., Carr Canyon (Huachuca Mts.), Chiricahua National Monument (Cochise Co.), Douglas, Dragoon, Fort Grant, Globe, Patagonia, Ruby, Sabino Basin (Santa Catalina Mts.), Tombstone, Tucson, Wickenburg, Wilcox; June to August. *New Mexico:* Tucumcari; July. *Texas:* Ysleta; September.

MEXICO: *Chihuahua:* Camargo, Catarinas, Las Delicias, Matachic, Meoqui, Parral, Primavera; July to September. *Coahuila:* Torreón. *Distrito Federal:* "Guadalu" [Guadalupe Hidalgo?]. *Guanajuata:* Gonzales "Jct.," Irapuato. *Guerrero:* Balsas. *Jalisco:* Guadalajara, Las Fuentes, La Venta; July. *Baja California*: Miraflores, Triunfo; July. *Morales*: Alpuyeca, Cuernavaca; June, September. *Nayarit:* Tepic; July. *Oaxaca:* Salina Cruz; July. *Sinaloa:* Mazatlán; August. *Veracruz:* "Pureza"; June.

CUBA: San Blas; May.

GUATEMALA: Antigua; June.

HONDURAS: Zamorano (2,600 feet); July.

COSTA RICA: San José; May.

DISCUSSION.—In previous literature this species generally has been considered synonymous with *ciliatus* Palisot de Beauvois (*mirabilis* auct., nec Perty). Although the two are admittedly very closely allied, they may be separated by the features given in the key to species. In addition, the range of *crassus* is distinct from that of *ciliatus*, being definitely more southern. *C. obtusus* Uhler has likewise been considered a synonym of *ciliatus*, but both the description and the type locality leave little doubt that it is the same form as *crassus*. It is surprising that no one has previously recognized the identity of Uhler's *obtusus* and Distant's *vestigiatus*. Both authors compared their specimens to "*mirabilis*" and pointed out several of the same sepa-

rating features, as in the following statements of comparison with "*mirabilis*":

	obtusus Uhler	*vestigiatus* Distant
Head:	More deeply emarginate in front	cleft at apices
Pronotum:	Punctures less numerous	sparingly, strongly punctate
Scutellum:	Very coarsely and sparingly punctured	very sparingly but very coarsely punctate.

Additional comments on the close relationship of the present form with the other species of the subgenus will be found in the introductory discussion of the subgenus and under the species *ciliatus*. The present understanding of this species would not have been possible without the full answers that Dr. W. E. China kindly supplied to questions about the types of Dallas, Walker, and Distant, and the replies from Dr. R. I. Sailer concerning Uhler's type of *obtusus*.

Ecological data are sparse for this species. One specimen from Texas was labelled simply "corn." Uhler, in the notes accompanying his original description of *obtusus*, reported that considerable wear and breakage were evident on the head and front legs of some of his specimens. Many of the specimens examined during the present study, especially those from Texas and Arizona, also showed considerable wear. In fact, one series of these specimens had most of the margin of the head worn off past the row of submarginal setigerous punctures and showed marked abrasion as far back as the interocular area. The anterior tibiae of these specimens were literally reduced to virtually unarmed stumps, the tarsi and all spines except those on the ventral margin were broken away and even the prominent tubercles that gave rise to the dorsal row of spines were nearly all completely worn down so that the width was reduced and the dorsal margin was only slightly crenulate. Since the members of this species show so much drastic wear, one wonders what significance this might have. As conjecture, one might suggest that the insects live in a more abrasive soil or are more aggressive in their burrowing. There was nothing but further conjecture to suggest that the cuticula might be softer here than elsewhere in the family.

Cyrtomenus (*Cyrtomenus*) *mirabilis* (Perty)

PLATE FIGURE 246

Cydnus mirabilis Perty, 1830, p. 166, pl. 33, fig. 6 (erroneously labeled as "*mutabilis*" on caption of plate).

Cyrtomenus mutabilis Dallas, 1851, p. 112.—Walker, 1867, p. 147 (part).

Cyrtomenus mirabilis Stål, 1876, p. 18.—Distant, 1880, p. 3 (part).—Signoret, 1881b, p. 199, pl. 6, fig. 19 (part).—Lethierry and Severin, 1893, p. 62 (part).

Macroscytus umbonatus Berg, 1879, p. 14.

DIAGNOSIS.—The absence of a partial, postmedian row of setigerous punctures on lateral third of sternites IV to VI and the large ocelli,

which are removed from the eyes by a space distinctly less than a transverse ocellar width, will separate *mirabilis* from the other members of the subgenus.

Description.—Male:

Head: Length more than half width, 1.55(1.40–1.69):2.28(2.12–2.40); interocular width, 1.36(1.30–1.43); anterior margin fully semicircular, broadly reflexed juga surpassing clypeus and convergent or contiguous in front of it; surface polished, with numerous strong, radiating rugae and scattered minute punctures; ocelli very large, separated from eye by space distinctly less than transverse ocellar width; jugum ventrally shining, in large part finely punctulate; maxillary plate alutaceous, with scattered, vague punctures. Antennal segments: I, 0.43(0.30–0.49); II, 0.30(0.26–0.34); III, 0.54(0.52–0.56); IV, 0.52(0.50–0.56); V, 0.52(0.50–0.56). Bucculae less than half as high as labial II; labium reaching bases of posterior coxae. Labial segments: I, 0.94(0.91–1.00); II, 1.29(1.26–1.33); III, 1.16(1.10–1.24); IV, 1.05(0.97–1.11).

Pronotum: Length more than half width, 3.09(2.96–3.40):5.13(4.67–5.42); lateral margin straight or slightly concave on basal two-thirds; with 8 to 18 submarginal setigerous punctures; transverse impression moderate, usually obsolete medially, marked by irregular, medially interrupted row of coarse punctures; anterior lobe with broad, shallow, subapical impression, punctation restricted to broad, subapical band and irregular lateral patch of few to many punctures; posterior lobe with few widely scattered punctures, especially in middle third.

Scutellum: Length subequal to width, 3.30(2.93–3.61):3.30(2.91–3.60); disc polished, with widely scattered, coarse, sunken punctures.

Hemelytron: Clavus and corium polished; clavus with one submedian row of punctures; mesocorium rather uniformly and closely punctate except in smooth space along radial vein and in two rows of close-set punctures paralleling claval suture; exocorium irregularly and less densely punctate than mesocorium; costa with four to eight setigerous punctures; membrane distinctly surpassing apex of abdomen.

Propleuron: Alutaceous, with few punctures in depression.

Mesopleuron: Lateral area shining, impunctate with few obsolete rugulae.

Metapleuron: Lateral margin of evaporatorium straight or slightly concave; lateral area polished, impunctate.

Legs: Anterior tibia dorsally with seven or eight stout, flattened, blunt spines arising from blackened elevations; posterior tibia moderately widened apically, greatest diameter less than that of anterior tibia.

Sternites: Polished, without postmedian rows of setigerous punctures at lateral third of segments III to VI.

Terminalia: Genital capsule polished, with scattered minute punctures more abundant laterally, apical margin nearly straight or faintly sinuate laterally, gonostylus as illustrated (fig. 246).

Length of body: 8.85(8.38–9.37).

FEMALE: Similar to male, subapical impression of pronotum less extensive.

Head: Length-width ratio, 1.47(1.43–1.56):2.31(2.25–2.41); interocular width, 1.41(1.36–1.44). Antennal segments: I, 0.43(0.40–0.46); II, 0.27(0.25–0.31); III, 0.53(0.44–0.60); IV, 0.50(0.47–0.56); V, 0.53(0.50–0.60). Labial segments: I, 0.92(0.86–1.06); II, 1.27(1.23–1.36); III, 1.16(1.10–1.23); IV, 1.03(0.94–1.11).

Pronotum: Length-width ratio, 3.04(2.85–3.42):4.99(4.85–5.36).

Scutellum: Length-width ratio, 3.07(2.40–3.60):3.25(3.00–3.61).

Length of body: 8.76(8.12–9.41).

TYPE DATA.—The unlocated type of *mirabilis* was said to have come from Brazil. Berg's types of *umbonatus* were reported as having come from the Argentine localities of Catamarca and Tucumán. One specimen (UnivNac) in a collection of miscellaneous material is labeled "Catamarca, *umbonatus* Berg, type." This obviously is one of the original types and is here designated the lectotype. Dr. Kormilev informed the author that no recognized types of this species are in any other Argentine museums that he visited.

SPECIMENS STUDIED.—12 males, 13 females.

BRAZIL: Campinas, Nova Teutonia, Porto Alegre, Taperina; October, November.

PERU: "Chauchamayo."

PARAGUAY: Asunción, Colonia Nuevo Italia, Horqueta; September to December.

ARGENTINA: Catamarca, Tucumán; December.

DISCUSSION.—Although the close resemblance between this form and the common form of the southern United States led most authors to consider them as one, there is sufficient difference to warrant separating them. In fact, the present study also separates a geographically intermediate form, *crassus* Walker. The form of the southern United States properly takes the name *ciliatus* Palisot de Beauvois, as explained under the treatment of that species in the present paper. Signoret's (1881a) synonymizing of Berg's *Macroscytus umbonatus* is supported by the finding of the "Catamarca" type mentioned above.

For a discussion of this species in relation to others of the subgenus, see comments in the introduction to this subgenus and those under *C. ciliatus*.

Genus *Tominotus* Mulsant and Rey

Tominotus Mulsant and Rey, 1866, p. 319.
Trichocoris Uhler, 1876, p. 277. New synonymy.
Psectrocephalus Van Duzee, 1922, p. 270. New synonymy.
Aethus of authors, nec Dallas (1851, p. 110).

Diagnosis.—This genus is best diagnosed by the lack of differentiated terminal part of the osteolar canal, the terete hind tibiae which have all spines similarly developed and by the complete, submarginal row of coarse, close-set setigerous punctures on the head.

Description.—Size small to large (4–12), oval, ovate or subparallel; dorsum much less convex than venter.

Head: Length usually more than half width, flattened to somewhat convex above; juga carinate dorsally on margin, as long as or longer than and convergent in front of clypeus; juga with a submarginal row of coarse, close-set punctures giving rise to long cilia and usually also to short, erect, stout pegs; eyes well developed, slightly to strongly projecting; ocelli absent or well developed, when present located on or behind a line connecting hind margins of eyes and separated from eyes by a space equal to or greater than an ocellar width; antennae 5-segmented, I shortest, others variable in proportion; bucculae low to very high, reaching nearly or quite to base of head; labium reaching from middle of mesosternum to middle of metasternum, labial II longest, compressed but without a foliaceous lobe, IV shortest.

Pronotum: Width about twice length; anterior margin moderately to strongly emarginate, without a paralleling submarginal groove; lateral margins carinate, narrowed on apical third or more, basal part straight or incurved, some males with slight to strong constriction submedially; lateral submarginal setigerous punctures variable in number and arrangement; posterior margin broadly but shallowly convex; transverse impression distinct to absent, usually marked by a row or band of distinct punctures.

Scutellum: Wider or narrower than long, triangular, apex broad and rounded (fig. 80) or distinctly narrowed (fig. 79); disc impunctate, weakly punctate or with numerous distinct punctures.

Hemelytron: Corial areas well defined; costa with one to many setigerous punctures; membranal suture straight or weakly bisinuate, curved anteriorly or posteriorly laterally; membrane distinctly less than one-third of hemelytral length, approaching, reaching or surpassing apex of abdomen.

Propleuron: Weakly to distinctly convex anterior to depression, usually with some punctures; prosternal carinae prominent, usually rather sharp; anterior margin slightly lobulate either side of middle.

Mesopleuron: Weakly concave; evaporatorium extensive to very restricted and interrupted by mesally projecting spur of lateral pol-

ished area (fig. 111); latter usually impunctate; mesosternum swollen, carinate on basal half or more and with numerous long hairs.

Metapleuron (fig. 111): Flattened; evaporatorium occupying mesal half or more of segment, vaguely or sharply defined from lateral area; latter with or without punctures; osteolar peritreme without a differentiated terminal lobe, sharply delimited apically or continued obliquely to anterior margin of segment: osteole opening posteriorly at emargination of peritreme, a subapical spur usually also present.

Legs: Short to moderately long; anterior tibia (fig. 117) distinctly compressed, dorsal margin with six to ten stout spines, not surpassing tarsal insertion; middle and posterior tibiae (fig. 140) slender, terete, equally spined on all margins; posterior tibia as long as or longer than abdomen; tarsal II shortest, I equal to or shorter than III.

Venter: Strongly convex, shining, with or without setigerous punctures; posterior margin of each segment finely to distinctly crenulate.

Type of genus.—*Cydnus* (*Tominotus*) *signoreti* Mulsant and Rey (1866, p. 319), monobasic; of *Trichocoris*, *Trichocoris conformis* Uhler (1876, p. 277), monobasic; of *Psectrocephalus*, *Psectrocephalus caecus* Van Duzee (1922, p. 271), original designation and monobasic.

Distribution.—This genus occupies a wide range from North Carolina, Tennessee, Missouri, Arizona, and California south through Central America and the Antilles to Argentina and Chile.

Discussion.—The separation of this genus from *Dallasiellus* marks a rather weak area in the present attempt to redefine the cydnid genera that occur in the Western Hemisphere. These two groups are both relatively unspecialized when compared to allied forms and so present no really strong features for separation. The complete submarginal row of coarse punctures does set off a group of closely allied species, but leaves the residuum containing species in which the submarginal row of punctures varies from absent to well developed and reaching almost to apex of jugum, this character being simply one extreme of an almost continuous variation.

Tominotus Mulsant and Rey, based on a species originally described from France, appears to be the correct name for this genus as it is the oldest included generic name. A rather unusual set of circumstances beclouds the soundness of this application, but a statement of events leading to this decision should indicate the reasons for making it. *Tominotus* was described in 1866 by Mulsant and Rey as a subgenus of *Cydnus* and contained the single, newly described species *signoreti*, that species being the genotype by the monobasic condition of the original proposal. The specimen on which it was based was reported as having come from the collection of Signoret and its locality of capture was given as "Montpellier," in France. The species was thus carried as a European form. However, Signoret (1881b)

reported that he was unable to separate *signoreti* from Berg's (1879) Argentine species *constrictus*; he further stated that Mulsant and Rey's French locality for their species had been due to a misinterpretation of the abbreviated locality "Mont." on his specimen label. He stated that this abbreviation stood for "Montevideo" and not "Montpellier." In view of Signoret's explanation (and in spite of the fact that he had given both names valid standing in his "Revision") and the fact that Mulsant and Rey's description leaves no doubt about the identity of their species with that of Berg's, one is forced to consider Berg's name as a synonym, as has already been done by Berg (1891, p. 171). *Tominotus* thus is available and must be considered in the study of nomenclature for forms of the Western Hemisphere.

But why replace the older, better known name *Aethus* of Dallas with *Tominotus?* In redefining the genera, the start must be made from the genotype. The genotype of *Aethus* Dallas (1851) is *Cydnus indicus* Fabricius, subsequently designated by Van Duzee (1914, p. 378). It possesses a differentiated terminal osteolar process (fig. 99), the shape of which is unlike that found in any species of cydnids found in the Western Hemisphere. The terminal process in *Aethus indicus* is almost semicircular with the convexity cephalad, a strong emargination in the transverse posterior margin and the surface in part polished. As thus restricted, *Aethus* appears to have a limited distribution chiefly in Asia; but as only limited extralimital material was available for study its range may be more extensive.

Thus, our American forms, none of which is congeneric with *Aethus indicus*, must take new generic names. After transferring certain other species, those which belonged to the *Aethus* of American authors (not Dallas) on the basis of a complete submarginal row of setigerous punctures must take the name *Tominotus* Mulsant and Rey (1866) because that name antedated all other included generic proposals, *Trichocoris* Uhler (1877) and *Psectrocephalus* Van Duzee (1922), by several years.

In *Tominotus* the vestiture arising from the submarginal row of setigerous punctures on the head may be uniformly hairlike, or may consist of a row of peglike setae with a few hairlike ones interspersed A caution for interpreting this character already given in the introduction to this study may be profitably repeated here: the burrowing habit often results in the breaking of the hairlike setae near their bases, resulting in what appears to be a row of the peglike setae. Although this vestiture character has not been used as a primary key character in the present study, it is mentioned in the description of each species and offers a usable recognition feature for certain groups

of the included species. But the caution must be heeded in interpreting the descriptions and especially in describing new forms.

Key to the known species of *Tominotus*

1. Mesopleural evaporatorium interrupted posteriorly by a transverse, marginal or submarginal polished band (fig. 111) 2
   Mesopleural evaporatorium not interrupted posteriorly by polished band . 11
2. Scutellar apex broad (fig. 80), half or more than half as wide as membranal suture 3
   Scutellar apex narrowed (fig. 79), distinctly less than half as wide as membranal suture 9
3. Pronotum with lateral submarginal setigerous punctures arranged in single, impressed row (fig. 68); costa with not more than ten setigerous punctures 4
   Pronotum with lateral submarginal setigerous punctures not confined to a single, submarginal row, but forming a wider, submarginal stripe, especially anteriorly (fig. 69); costa usually with fifteen or more setigerous punctures 8
4. Pronotum laterally with many distinct, moderately coarse punctures on both lobes 5
   Pronotum laterally with few or no distinct punctures laterally (sometimes with minute punctures) 7
5. Costa creamy white, contrasting strongly with dark brown corium.
   albicostus, new species (p. 543)
   Costa concolorous with remainder of corium 6
6. Tibiae yellowed, in contrast to reddish-brown femora; size larger, length of body, 6.9–8; lateral pronotal margins of males not constricted.
   brevis (Signoret) (p. 547)
   Tibiae concolorous with femora; size smaller, length of body, 5–5.2; lateral pronotal margins of males strongly constricted near middle (fig. 6).
   signoreti (Mulsant and Rey) (p. 566)
7. Membranal suture virtually straight (fig. 82); scutellum with few widely scattered punctures; larger, length of body, 8.6.
   impuncticollis (Distant) (p. 560)
   Membranal suture distinctly bisinuate (fig. 81); scutellum with many crowded punctures; smaller, length of body, 5.5.
   blanchardi (Signoret) (p. 544)
8. Abdomen polished, impunctate except in spiracular area; larger, length of body, 8.5–10.0 . . . . **hogenhoferi** (Signoret) (p. 559)
   Abdomen and dorsal surface, except membrane, with coarse punctures giving rise to long, golden setae similar to those along lateral margins; smaller, length of body, 5.0–6.8 . . . . . . **conformis** (Uhler) (p. 554)
9. Corium alutaceous; costa with two or three setigerous punctures.
   brevirostris, new species (p. 545)
   Corium polished; costa with five to ten setigerous punctures 10
10. Size smaller, length of body 5.1–7.3; labium surpassing middle coxae.
    communis (Uhler) (p.551)
    Size larger, length of body 9.1–10.8; labium not surpassing middle coxae.
    curvipes (Dallas) (p. 556)
11. Ocelli present, distinct; costa with not more than five setigerous punctures . 12
    Ocelli absent; costa with ten or more setigerous punctures.
    caecus (Van Duzee) (p. 549)

12. Costa with one setigerous puncture; male with apex of genital capsule distinctly V-emarginate . . . . **unisetosus,** new species (p. 567)
    Costa with two to four setigerous punctures; male with apex of genital capsule not V-emarginate 13
13. Clypeus with two subapical setigerous punctures; size smaller, length of body 3.7–4.5 . . . . **laeviculus** (Berg) (p. 564)
    Clypeus without subapical setigerous punctures; size larger, length of body 4.8–5.5 . . . . **inconspicuus,** new species (p. 562)

Tominotus albicostus, new species

Diagnosis.—The creamy white costa plus the unicolorous pronotum will separate this species from all other Cydnidae known to occur in the Western Hemisphere.

Description.—From a single specimen. Female: Broadly oval. Head: Length about two-thirds width, 1.26:1.80; interocular width, 1.28; juga rounded, forming a semicircle, as long as clypeus, latter with two subapical setigerous punctures; jugum with a complete, submarginal, depressed row of coarse setigerous punctures giving rise to long hairlike setae and stout pegs; surface slightly convex, weakly rugose radially, punctate only toward margins; ocelli small, separated from eyes by space about four times an ocellar width; jugum ventrally and maxillary plate (except posteriorly) impunctate. Antennal segments: I, 0.36; II, 0.33; III, 0.35; IV, 0.40; V, 0.46. Bucculae lower than labial II; labium reaching between middle coxae. Labial segments: I, 0.60; II, 0.76; III, 0.70; IV, 0.46.

Pronotum: Length less than half width, 1.99:4.26; anterior margin broadly and deeply emarginate; lateral margins entire, not emarginate, with about thirty setigerous punctures in a single, submarginal row; transverse impression slightly behind midlength, obsolete, marked by an irregular band of slightly coarser punctures; anterior lobe impunctate discally, a few distinct punctures anteriorly and a wide band of them laterally, surface finely alutaceous except on impunctate calli; posterior lobe weakly and finely alutaceous, with fine, irregular punctures over most of width.

Scutellum: Wider than long, 2.87:2.36; finely alutaceous; with numerous irregular, crowded punctures, except basally.

Hemelytron: Clavus and corium alutaceous; clavus with irregular, partly confluent punctures; corium with numerous punctures, these more abundant in two rows paralleling claval suture and on exocorium; costa with twelve setigerous punctures; membranal suture bisinuate, lateral angle slightly acute; membrane longer than basal width.

Propleuron: More or less alutaceous, punctured anteriorly, in depression and in lateroposterior angle.

Mesopleuron: Evaporatorium separated from posterior margin of segment for nearly full width; lateral area with few distinct punctures; posterior margin entire.

Metapleuron: Evaporatorium occupying mesal half, prolonged laterally along anterior margin; peritreme extended about one-third across segment, evanescent apically; lateral area alutaceous and punctate on mesal two-thirds.

Legs: Moderately long; posterior tibia straight.

Sternites: Alutaceous, finely punctate, with few irregular rugae laterally.

Length of body: 6.29.

TYPE DATA.—Holotype female (Wien) labeled "Fiebrig, Paraguay, S. Bernardino."

DISCUSSION.—As indicated in the key, this species is most closely allied to *brevis* Signoret and *signoreti* Mulsant and Rey. In addition to the key characters it agrees with these in general habitus, being broadly oval, with a semicircular head, and having the dorsum and venter alutaceous. Its large size (6.29) and creamy white costa separate it from *signoreti*, while the pale costa and the greater number (about 30:15) of submarginal setigerous punctures laterally on the pronotum distinguishes it from *brevis*.

Tominotus blanchardi (Signoret), new combination

PLATE FIGURE 81

Aethus blanchardi Signoret, 1863, p. 545.—Walker, 1867, p. 152.—Stål, 1876, p. 27.

Cydnus ? blanchardi Signoret, 1882, p. 154, pl. 6, fig. 91.

Cydnus blanchardi Lethierry and Severin, 1893, p. 65.

DIAGNOSIS.—Among those members of the genus whose body length is less than 6 mm., the broad scutellar apex and lack of distinct punctures towards sides of pronotal lobes will identify this species.

DESCRIPTION.—Based on the single available specimen which lacked antennae, legs and abdomen, consequently sex is unknown. Oval.

Head: Length two-thirds width, 0.90:1.36; interocular width, 0.94; surface shining, juga with few obsolete, radiating rugae and numerous very fine punctures; ocelli small, separated from eye by twice an ocellar width; jugum ventrally and maxillary plate impunctate, latter finely alutaceous; antennae missing; bucculae lower than height of labial II. Labial segments: I, 0.40; II, 0.61; III, 0.47; IV, 0.34.

Pronotum: Length half width, 1.40:2.81; anterior margin broadly and moderately emarginate; side margins strongly converging from base; with a single submarginal row of about 25 setigerous punctures; transverse groove slightly behind midlength, very feeble; anterior lobe shining, with fine but distinct punctures behind anterior emargination and a few obsolete punctures laterally; posterior lobe with irregularly scattered moderate to minute punctures.

Scutellum: Little longer than wide, 1.85:1.75; surface shining, disc with numerous close-set punctures coarser than those of pronotum, apex with fine punctures; apex broadly angled, more than half as wide as membranal suture.

Hemelytron: Corial areas well defined, alutaceous; exocorium more closely punctured than disc, latter with a single row of close-set punctures; paralleling claval suture; clavus alutaceous, with two longitudinal rows of punctures; costa with ten or twelve setigerous punctures; membranal suture strongly bisinuate (fig. 81), lateral angle acute; membrane longer than basal width.

Propleuron: Finely alutaceous, impunctate; prosternal carinae thick, prominent, abruptly and acutely terminated ventrally, area between depressed.

Mesopleuron: Evaporatorium triangular, extending about three-fourths across segment, and separated from posterior margin of segment nearly to base by polished area.

Metapleuron: Evaporatorium reaching three-fourths across segment, lateral two-fifths more shining; peritreme abruptly terminated before middle of segment.

Legs, abdomen and terminalia: All missing.

Length of body: About 5.5.

Type data.—The author has been unable to locate Signoret's type, reported as having come from Chile.

Specimen studied.—A broken specimen (USNM) of unknown sex, reported from Chile.

Discussion.—The specimen (USNM) studied was old and incomplete, lacking antennae, legs, and abdomen. It bore an unusual, double-spaced, blue-bordered label with a determination of "*Aethus blanchardi*" in what appeared to be Signoret's handwriting, and a penciled note, "Chile." This specimen may have been a part of the Uhler collection, although it was not so labeled.

In illustrating this species in his "Revision," Signoret (1882) depicted the peritreme as terminating in an auricular lobe. The specimen at hand showed the peritreme ending abruptly, but not in the loop or ear-shape structure implied by Signoret.

Tominotus brevirostris, new species

Plate figure 247

Diagnosis.—The large size (9.5–10.2) plus the strongly alutaceous coria will differentiate this species from all others in the genus.

Description.—Male: One specimen. Elongate-oval.

Head: Length more than two-thirds width, 1.75:2.34; interocular width, 1.52; outline semicircular, juga narrowing clypeus or contiguous beyond it; clypeus without subapical punctures; juga roughened by

many crowded, distinct, radiating rugae and a few moderate punctures, submarginal row of punctures giving rise to long cilia and no pegs (all specimens badly abraided); vertex impunctate; ocelli separated from eyes by almost twice an ocellar width; juga ventrally and maxillary plate impunctate. Antennal segments: I, 0.53; II, 0.70; III, 0.70; IV, 0.93; V, 1.00. Bucculae as high as labial II, almost to abrupt posterior end; labium reaching to middle of mesosternum. Labial segments: I, 0.76; II, 1.10; III, 0.83; IV, 0.56.

Pronotum: Length slightly more than half width, 2.85:5.42; anterior margin deeply, almost semicircularly emarginate; side margins entire, not constricted opposite ends of transverse groove, with a single, submarginal row of six setigerous punctures; transverse groove absent, marked by irregular band of small, distinct punctures that laterally extends anteriorly and posteriorly on otherwise impunctate pronotal lobes.

Scutellum: Length and width subequal, 3.42:3.49; triangular, apex narrowed; very faintly alutaceous, with numerous irregularly scattered moderate punctures which get closer and finer toward apex.

Hemelytion: Corial areas well defined, strongly alutaceous; mesocorial area with distinct punctures only in basal part and in one complete row and one incomplete row paralleling claval suture, apically with widely separated, very fine punctures; exocorial area with distinct punctures only at base; radial vein and costa with numerous fine punctures, costa also with two or three setigerous punctures; clavus alutaceous like corium, with two partial rows of punctures; membranal suture weakly bisinuate, lateral angle slightly projecting; membrane distinctly longer than basal width, distinctly surpassing apex of abdomen.

Propleuron: With few distinct punctures ventrally in depression.

Mesopleuron: Evaporatorium extending into posterolateral angle, interrupted near posterior margin by weak polished band; posterior margin of segment moderately coarsely crenulate.

Metapleuron: Evaporatorium occupying about mesal two-thirds of segment, lateral margin well defined, strongly concave; peritreme ıeaching about halfway across segment, posterior subapical emargination with a distinct, flattened process.

Venter: Alutaceous, almost smooth and with numerous minute punctures along midline, vaguely roughened laterally.

Terminalia: Apical margin of genital segment not entire and not flared marginally; gonostyli as illustrated (fig. 247).

Length of body: 10.00.

Female: Very similar to male.

Head: Length-width ratio, 1.71(1.56–1.95):2.34(2.25–2.42); interocular width, 1.56(1.49–1.66). Antennals segments: I, 0.54 (0.50–

0.60); II, 0.78(0.76–0.83); III, 0.64(0.56–0.70); IV, 0.94(0.90–1.00); V, 1.04(1.00–1.16). Labial segments: I, 0.81(0.76–0.90); II, 1.06 (1.00–1.12); III, 0.89(0.86–0.93); IV, 0.57(0.55–0.61).

Pronotum: Length-width ratio, 2.88(2.78–3.00):5.45(5.25–5.67).

Scutellum: Length-width ratio, 3.51(3.36–3.71):3.42(3.28–3.57).

Length of body: 9.91(9.56–10.14).

Type data.—Holotype male (USNM 64427) and allotype female (USNM), 10 kilometers northeast of Taxco, Guerrero, Mexico, Apr. 4, 1943, W. F. Foshag. Paratypes as follows:

Mexico: *Guerrero:* Taxco, same data as types, 11 females (USNM, RCF). *México:* Tejupilco, June 30, 1933, H. R. Hinton and R. L. Usinger, 2 females (RLU). *Michoacán:* 12 miles south of Tzitzio on Huetamo road, July 9, 1947, 3 females (RFH).

Discussion.—The trivial name, *brevirostris*, is in allusion to the labium reaching only to the middle of the mesosternum and not to the middle coxae or farther as occurs in most species of the family.

The large size and generally alutaceous dorsal and ventral surfaces suggest that this species might be closely related to the members of the genus *Ectinopus*, but the lack of a differentiated terminal process on the osteolar peritreme, the presence of three primary setigerous punctures on a jugum, and the complete row of submarginal setigerous punctures on the jugum each would prevent assignment of it to that genus.

***Tominotus brevis* (Signoret), new combination**

Plate figures 68, 248

Aethus (*Tominotus*) *brevis* Signoret, 1881, p. 426, pl. 11, fig. 55.
Aethus neotropicus Jensen-Haarup, 1926, p. 49. New synonymy.

Diagnosis.—The decidedly yellowed tibiae (especially the hind pair), which contrast with the reddish brown femora, will readily separate this species from others in the genus.

Description.—Male: Based on two specimens. Broadly oval.

Head: Length nearly two-thirds width, 1.29(1.23–1.36):1.90(1.86–2.02); interocular width, 1.25(1.20–1.30); juga rounded, forming a semicircle, as long as clypeus, latter with two subapical setigerous punctures; juga with a complete, submarginal, depressed row of coarse setigerous punctures giving rise to stout pegs with a few interspersed cilia; surface slightly convex, with weak radiating rugae and scattered minute punctures; ocelli small, separated from eyes by more than three times an ocellar width; jugum ventrally and maxillary plate (except posteriorly) impunctate. Antennal segments: I, 0.38(0.36–0.43); II, 0.45(0.40–0.50); III, 0.47(0.43–0.51); IV, 0.62(0.58–0.66); V, 0.64(0.60–0.66). Bucculae lower than height of labial II; labium slightly surpassing middle coxae. Labial segments:

I, 0.88(0.83–0.95); II, 1.24(1.13–1.33); III, 0.97(0.96–1.03); IV, 0.61(0.53–0.68).

Pronotum: Width more than twice length, 4.52(3.97–4.66):2.10 (1.92–2.28); anterior margin broadly and deeply emarginate; lateral margins entire, not emarginate, with about 15–20 setigerous punctures in a single, submarginal row (fig. 68); transverse impression slightly behind midlength, marked by a more or less regular row of moderately coarse punctures; anterior lobe with numerous similar punctures laterally and a number of finer ones subapically, surface very finely alutaceous, except on impunctate calli; posterior lobe very weakly alutaceous, with punctures more numerous laterally than discally.

Scutellum: Length and width subequal, 2.61(2.50–2.73):2.66(2.47–2.88); surface with weak, transverse wrinkles and numerous fine, close-set, longitudinal striae between distinct punctures which become finer and closer toward apex; latter more than half as wide as membranal suture.

Hemelytron: Corial areas well defined, strongly but finely alutaceous and distinctly and rather uniformly punctured with two regular rows of punctures paralleling claval suture; clavus alutaceous, with two regular rows of distinct punctures; membranal suture obtusely angularly convex, rectangular at outer angle; membrane slightly surpassing apex of abdomen, a little longer than basal width.

Propleuron: Very weakly alutaceous, punctured at anteroventral angle and in depression; prosternal carinae prominent, thick, calloused, abruptly and rectangularly terminated posteriorly.

Mesopleuron: Evaporatorium separated from posterior margin for nearly full length by polished band; lateral area with few distinct punctures; posterior margin weakly crenulate.

Metapleuron: Evaporatorium occupying about half of segment; lateral area immediately adjacent to it with distinct rugae and punctures; peritreme extending about one-third across segment, becoming evanescent apically.

Sternites: Smooth, sometimes visibly alutaceous laterally.

Legs: Moderately long, posterior tibia virtually straight.

Terminalia: Genital capsule shining, obsoletely rugulose, impunctate, apical margin virtually straight; gonostylus as illustrated (fig. 248).

Length of body: 6.97(6.90–7.05).

Female: Very similar to male except that antennal segment II is equal in length to III instead of being shorter as in the male, and the scutellum is distinctly wider than long instead of having the length and width subequal.

Head: Length-width ratio, 1.34(1.30–1.38):2.05(1.98–2.08); inter-

ocular width, 1.33(1.27–1.37). Antennal segments: I, 0.40(0.40–0.42); II, 0.49(0.46–0.53); III, 0.47(0.46–0.48); IV, 0.61(0.60–0.66); V, 0.63(0.60–0.66). Labial segments: I, 1.02(1.00–1.06); II, 1.26(1.13–1.33); III, 0.98(0.90–1.06); IV, 0.64(0.60–0.70).

Pronotum: Width-length ratio, 4.54(4.46–4.69):2.18(2.02–2.37).

Scutellum: Width-length ratio, 3.05(2.93–3.13):2.86(2.75–3.06).

Length of body: 7.60(7.20–7.95).

Color: Above piceous with metallic reflections, broad margin of head, side margins of pronotum and all of corium usually paler; membrane milky white, marks along veins and between them fuscous; ventrally slightly paler, acetabulae and femora reddish brown; antennae, labium, prosternal carinae, basal third or more (all of posterior) of tibiae, and tarsi distinctly yellow.

Type data.—A female specimen (Wien) bears a red type label and a locality label "Brasil." This specimen was made available for study. Since there is no reason to doubt that this was one of the original specimens, it is here designated as lectotype. In the original description two localities were cited, "Bresil" and "Nouvelle Grenada."

Specimens studied.—6 males, 6 females.

Venezuela: Yaracuy, G. Pittier, 1 male (USNM).

Colombia: Bogotá, July 20, 1927, M. H. Nicefero, 1 female (JCL). Bonda, June, 3 males, (Car, RCF). Río Frío, Magdalena, May 13, 1927, G. Salt, 1 female (USNM). Santa Marta, Dec. 26, 1910, F. M. Gaige, 1 male, 1 female (RFH). Santa María Mts., Valle del Tamacal, Sept. 22, 1920, F. M. Gaige, 1 male, 1 female (RFH). Villa Vieja, April 11, 1945, 1 female (CalAc).

Brazil: No exact locality, type female (Wien).

Discussion.—Little information is available on this well-marked form, but for some comments on its close relationship to other species see the discussion under *Tominotus albicostus*, new species.

Tominotus caecus (Van Duzee), new combination

Plate figure 249

Psectrocephalus caecus Van Duzee, 1922, p. 271.—Torre Bueno, 1939, p. 182.

Diagnosis.—This is the only species in the genus that is without ocelli. All the others have the ocelli moderately to strongly developed and conspicuous.

Description.—Based on two males and one female.

Male: Elongate-oval.

Head: Length more than two-thirds width, 0.98(0.93–1.03): 1.38(1.30–1.46); interocular width, 0.99(0.93–1.06); anterior outline broadly semicircular, eyes projecting by less than one-third width; juga surpassing and nearly contiguous beyond apex of clypeus, latter without subapical setigerous punctures; juga with sharp margins

distinctly reflexed, submargin with distinct pegs and a few long cilia, surface shining and with short radiating rugae and punctures; vertex with few or no punctures; jugum ventrally and maxillary plate (except posteriorly) impunctate. Antennal segments: I, 0.28(0.26–0.30); II, 0.28(0.26–0.30); III, 0.31(0.30–0.33); IV, 0.30(0.30–??); V, 0.33(0.33–??). Bucculae slightly lower than height of labial II, evanescent posteriorly; labium reaching between middle coxae. Labial segments: I, 0.58(0.56–0.60); II, 0.69(0.63–0.76); III, 0.51(0.43–0.60); IV, 0.36(0.34–0.38).

Pronotum: Width slightly more than twice length, 2.92(2.79–3.06):1.39(1.36–1.43); anterior margin moderately deeply and almost simply emarginate; side margins subparallel on basal fourth, thence gently narrowed to broadly rounded anterior angles, not emarginate opposite ends of transverse groove; lateral submarginal row of some 30 setigerous punctures giving rise to long, reddish cilia; transverse groove broad, very shallow, situated near basal fourth; anterior lobe with broad lateral area and narrower anterior area with distinct punctures, calli and median line impunctate; posterior lobe and transverse groove with numerous scattered, distinct punctures across width.

Scutellum: Distinctly longer than wide, 2.15(2.02–2.28):1.85(1.75–1.95); triangular, apex narrowed, disc with numerous distinct punctures which are missing from narrow basal area and are more numerous at apex.

Hemelytron: Corial areas weakly defined; corium and clavus with numerous distinct punctures, these more dense on exocorium and in single impressed row paralleling claval suture; membranal suture bisinuate and slightly acute laterally; membrane somewhat longer than wide, just attaining apex of abdomen.

Propleuron: Polished, impunctate, prosternal carinae low, rather sharp. Mesopleuron: Evaporatorium extending uninterrupted into posterolateral angle of segment. Metapleuron: Evaporatorium occupying mesal two-thirds of segment, lateral margin concave; lateral area impunctate; peritreme reaching almost to middle of segment, apex fused with cuticle.

Venter: Shining, impunctate, with a few weak, usually short rugae laterally.

Terminalia: Subgenital plate not reflexed marginally, apex feebly convex with the faintest trace of a median emargination; gonostyli as illustrated (fig. 249).

Length of body: 5.55(5.24–5.87).

Female: Generally similar to male.

Head: Length-width ratio, 0.98:1.40; interocular width, 0.96. Antennal segments: I, 0.30; II, 0.33; III, 0.30; IV, 0.36; V, ??. Labial segments: I, 0.55; II, 0.70; III, 0.50; IV, 0.36.

Pronotum: Width-length ratio, 3.00:1.43.

Scutellum: Length-width ratio, 2.28:2.06.

Length of body: 5.68.

Type data.—Holotype male (CalAc,926), and allotype female (CalAc, 927), Pasadena, Calif., Oct. 12, 1916, "one pair taken among ants under a stone" (Van Duzee, 1922, p. 271).

Specimens studied: 2 males, 1 female.

United States: *California:* Greenhorn Mt., Kern Co., June 17, 1930, 1 male (KU). Los Angeles, Coquillett, 1 male (USNM).

Mexico: "S.W. Mex.," 1 female (USNM).

Discussion.—Further comments given by Van Duzee with the original description carry the information that the three paratypes had also been taken "under stones," and that he believed that "This species undoubtedly is an inhabitant of ants' nests and may be common in such situations."

Tominotus communis (Uhler), new combination

Plate figures 54, 55, 72, 79, 250

Aethus communis Uhler, 1877, p. 379; 1886, p. 3.—Signoret, 1882, p. 35, pl. 2, fig. 76.—Van Duzee, 1917, p. 20.—Barber and Bruner, 1932, p. 235.—Torre Bueno, 1939, p. 179.

Aethus politus Signoret, 1882, p. 36, pl. 2, fig. 77.—Uhler, 1886, p. 3.—Van Duzee, 1917, p. 20.—Torre Bueno, 1939, p. 179. New synonymy.

Cydnus communis Lethierry and Severin, 1893, p. 65.—Banks, 1910, p. 99.

Cydnus politus Lethierry and Severin, 1893, p. 67.—Banks, 1910, p. 99.

Diagnosis.—The moderate size (5.14–7.22), narrowed scutellar apex, and polished dorsum will separate this species from its congeners.

Description.—Male: Oval.

Head: Length more than half width, 1.02(0.93–1.10):1.62(1.43–1.75); interocular width, 1.04(0.91–1.13); jugum rounded, forming a semicircle or flattened semicircle (figs. 54, 55) (see Discussion), as long as clypeus, latter with two subapical setigerous punctures; jugum with a complete, submarginal, depressed row of setigerous punctures giving rise to a row of stout pegs and several long cilia; surface slightly convex, sometimes longitudinally depressed just mesad of eyes, neither punctate nor rugose; ocelli well-developed, separated from eyes by a space slightly more than an ocellar width; jugum ventrally impunctate; maxillary plate impunctate except for several coarse, very close-set punctures posteriorly. Antennal segments: I, 0.33 (0.30–0.36); II, 0.38(0.30–0.46); III, 0.33(0.30–0.38); IV, 0.41(0.36–0.51); V, 0.50(0.46–0.56). Bucculae much lower than labial II, evanescent posteriorly; labium very slightly surpassing middle coxae. Labial segments: I, 0.68(0.60–0.72); II, 0.84(0.73–0.99); III, 0.74 (0.66–0.80); IV, 0.57(0.46–0.63).

Pronotum: Width slightly more or less than twice length, 3.34 (2.86–3.84):1.67(1.36–2.02); anterior margin broadly and moderately deeply emarginate; lateral margins faintly to very strongly constricted at midlength (fig. 72) (see Discussion), with submarginal row of some twenty setigerous punctures; transverse impression slightly postmedian, absent except laterally, usually marked by a medially interrupted row of distinct punctures; anterior lobe impunctate discally, laterally with numerous close-set, very fine punctures and occasionally several scattered coarser ones; posterior lobe impunctate or with fine punctures laterally.

Scutellum: Usually little longer than wide, 2.21(1.91–2.60):2.16 (1.82–2.47); surface polished, with few to several distinct punctures discally and numerous fine ones apically; apex narrowed, width less than half of membranal suture.

Hemelytron: Corial areas well defined; surface polished to vaguely alutaceous, variously punctured (see Discussion) but more coarsely so basally and in two rows paralleling claval suture; clavus with coarser punctures arranged in longitudinal rows; costa with five to eight setigerous punctures; membranal suture nearly straight, slightly acute at lateral angle.

Propleuron: Smooth or faintly alutaceous, punctate only in depression.

Mesopleuron: Evaporatorium reaching two-thirds across segment, separated from posterior margin by a polished band; lateral area somewhat rugose, impunctate.

Metapleuron: Evaporatorium occupying mesal two-thirds or three-fourths of segment, polished area smooth, impunctate: peritreme extending about half-way across segment, apex fusing with surrounding cuticle or more or less free due to forward curving of posterior margin, lateral polished area impunctate; sternites polished, impunctate.

Legs: Moderately long, posterior femur with a subapical, midventral tubercle (see Discussion); posterior tibiae distinctly curved in apical half.

Terminalia: Genital capsule polished, with few punctures laterally, apical margin weakly sinuate; gonostylus as illustrated (fig. 250).

Length of body: 6.34(5.38–7.19).

Female: Very similar to male, subapical tubercle on midventer of posterior femur sometimes absent; measurements averaging larger.

Head: Length-width ratio, 1.08(1.03–1.16):1.74(1.60–1.89); interocular width, 1.12(1.01–1.24). Antennal segments: I, 0.33(0.30–0.38); II, 0.37(0.33–0.43); III, 0.31(0.30–0.36); IV, 0.43(0.38–0.50); V, 0.49(0.43–0.53). Labial segments: I, 0.71(0.63–0.80); II, 0.89 (0.80–1.00); III, 0.78(0.70–0.84); IV, 0.58(0.53–0.63).

Pronotum: Width-length ratio, 3.57(3.16–3.90):1.73(1.49–2.02).

Scutellum: Length-width ratio, 2.39(2.08–2.66) : 2.32(2.08–2.66).

Length of body: 6.65(5.70–7.56).

Type data.—Uhler's types (USNM) were reported from "Cuba, sent from Havana by Prof. Felipe Poey, and from the interior of the island by Mr. Charles Wright; also, from near St. John's River, Florida." Signoret's type specimen (Wien) from "California" bears a red type label and is hereby designated the lectotype. His other type specimen (USNM) is labeled "Nicaragua."

Specimens studied.—37 males, 50 females.

United States: *Alabama:* Mobile; November. *California:* No exact locality. *Florida:* Crescent City, Dunedin, Gainesville, Indian River, Key West, Lacoochee, Lakeland, Lutz, Melrose, Miami, St. Augustine; January to December. *Georgia:* Thomasville, Tifton; July. *Illinois:* Grant City State Park; June. *Mississippi:* Biloxi; April. *North Carolina:* Southern Pines; January. *South Carolina:* Berkeley Co., Florence; February, April. *Tennessee:* Allardt, Roane Co.; April, June. *Texas:* Alligator Head, Bastrop, Navasota, Uvalde, Waco; May, June.

Nicaragua: No exact locality.

British West Indies: Anguilla; October. Santo Domingo Cay; April.

Cuba: Baraquá, "Central Saronu," Habana, Maísi, Pico Turquino, Santiago de las Vegas, Soledad, Taco Taco; April to August.

Haiti: "Diquini," "Étang Lachaux," Grande Rivière, Pétionville, August, October.

Dominican Republic: Santo Domingo; May.

Puerto Rico: Bayamón; January.

Bahamas: South Bimini Island; July.

Discussion.—After a study of more than 80 specimens from across the United States and the islands of the Caribbean (including both of Signoret's types), the identity of *Aethus communis* Uhler and *Aethus politus* Signoret is apparent. Dr. Sailer compared the types of Signoret's *politus* with the Uhler types of *communis* and expressed agreement as to the specific identity of the two. Uhler's species was well defined and so is easily identified; Signoret's species was compared to it and three special differences were pointed out: more constricted form of the prothorax, freer end of the osteolar canal, and the polished area laterad of the vaporative areas smooth but "strioles punctués" in *communis*. The first two of these differences appear quite variable, even in specimens from the same locality, and combine with other variable characters in several ways. The third character concerning the sculptured lateral polished area does not appear in any specimens at hand, suggesting that perhaps the specimens of *communis* to which Signoret referred were unusual in that respect. The most unusual thing about Signoret's types is that they came from widely separated localities outside of the range of the species as determined here; but since both types were seen, there can be no doubt about their being identical with *communis*.

The goodly series seen showed this to be a rather variable species with certain variations having geographical significance but that the variations are clinal, merging by easy stages from one condition in the north to the other condition in the southern part of the range. Other variations are without geographic occurrence. The two most conspicuous of the geographic variations involve corial punctation and the shape of the head. The corial punctures in specimens from Missouri, Tennessee, and North Carolina are distinct, numerous and consistent, while the specimens from Cuba and the Bahamas show distinct punctures only toward base of hemelytra and in rows paralleling claval suture. Specimens from intermediate geographic localities exhibit intermediate conditions so that there is no discontinuous break lending itself to the establishment of a named subspecies. This condition is also true for the shape of the head. Specimens from the northern part of the range have the head in the shape of a strongly flattened, almost truncated semicircle (fig. 54), and as specimens from gradually more southern localities are studied they are seen to have less truncated outlines to the head until in Cuba, Haiti and the Bahamas they present nearly semicircular forms (fig. 55).

Among the apparently nonregional variations are: (1) shape of the pronotal side margins of males which vary from decidedly constricted through weakly to virtually not sinuate, with the most extreme constriction appearing in a series of five specimens from South Bimini Island, Bahamas; (2) the apical end of the osteolar canal varies from decidedly limited by an abrupt anterior curving of the posterior free margin through a weaker and shorter curve to having the end fuse imperceptibly with the cuticle beyond (widely varying examples of this often show in material from the same locality); and (3) the development of the subapical tubercle on the midventer of the hind femur varies from completely absent in some females to strong and elevated on a swelling in some males; all males seen showed the tubercle in sufficient development to permit its use to separate males of this species from males of all its congeners except *curvipes* (Dallas).

Tominotus conformis (Uhler), new combination

Plate figure 251

Trichocoris conformis Uhler, 1876, p. 277; 1877, p. 372.
Aethus conformis Signoret, 1881b, p. 425, pl. 11, fig. 54.—Uhler, 1886, p. 3.—Van Duzee, 1917, p. 20.
Cydnus conformis Lethierry and Severin, 1893, p. 65.—Banks, 1910, p. 99.
Aethus (*Trichocoris*) *conformis* Torre Bueno, 1939, p. 178.

Diagnosis.—Within the genus this species may be recognized by the great abundance of golden hair which not only forms a dense fringe around the outer margin of the insect but also arises individually from many of the coarse punctures of the dorsum and venter.

DESCRIPTION.—MALE: Oval.

Head: Wider than long, 1.47(1.36–1.56):1.02(0.93–1.10); interocular width, 0.97(0.90–1.04); juga semicircular, slightly but distinctly surpassing clypeus, not or only slightly converging in front of latter and leaving a rectangular emargination at apex of head; eyes projecting by more than half their width; clypeus with a few coarse, transverse rugae and two subapical setigerous punctures; jugum with a submarginal row of coarse, close-set punctures giving rise to long cilia and stout pegs, surface with numerous coarse punctures, some of them contiguous in radiating rugae; vertex polished, a few coarse punctures medially; ocelli present, separated from eye by more than ocellar width; jugum ventrally polished, impunctate; maxillary plate with few coarse punctures, especially posteriorly. Antennal segments: I, 0.36(0.31–0.40); II, 0.28(0.25–0.33); III, 0.34(0.31–0.38); IV, 0.43(0.40–0.48); V, 0.41(0.38–0.46). Bucculae lower than labial II; labium reaching between middle coxae. Labial segments: I, 0.60 (0.56–0.63); II, 0.86(0.81–0.90); III, 0.63(0.60–0.66); IV, 0.48(0.46–0.51).

Pronotum: Width almost twice length, 3.15(2.90–3.41):1.67(1.47–1.82); anterior margin moderately biemarginate; lateral margins entire, not emarginate opposite ends of transverse impression; latter postmedian, weakly indicated and usually obsolete medially; anterior lobe impunctate except for broad lateral band of coarse, setigerous punctures; posterior lobe with numerous similar setigerous punctures scattered over surface, those along transverse impression coarser, elongate.

Scutellum: As long as or slightly longer than width, 2.07(1.82–2.28): 2.05(1.82–2.25); surface polished, with coarse, sunken punctures scattered over disc, basal angles impunctate.

Hemelytron: Corial areas well defined, disc with scattered moderate punctures intermixed with finer ones; coarse ones along claval suture forming two rows; exocorium more closely and coarsely punctured; costa with many close-set, irregularly arranged setigerous punctures; clavus with two irregular rows of coarser punctures; membranal suture straight, lateral angle rounded; membrane reaching apex of abdomen, basal width slightly more than half of length.

Propleuron: Smooth, with a few coarse punctures at anteroventral angle, in depression and near posterolateral angle; prosternal carinae ventrally abruptly terminated at almost a right angle, with a broad, deep trough between them.

Mesopleuron: Evaporatorium restricted, interrupted on outer half along posterior margin; lateral area in part rugose, with few coarse punctures.

Metapleuron: Evaporatorium slightly surpassing middle of segment, lateral margins concave; lateral area with few coarse punctures; peritreme elongate, becoming evanescent along anterior margin of segment; osteole opening posteriorly in a distinct notch occupied by a small tongue.

Legs: Moderately long, posterior tibiae slightly curved.

Sternites: With numerous coarse setigerous punctures irregularly spaced over all but midline.

Terminalia: Genital capsule polished, coarsely, closely punctate on lateral third or more; gonostylus as illustrated (fig. 251).

Length of body: 5.74(5.06–6.24).

Female: Very similar to male, posterior tibiae straight; measurements averaging larger.

Head: Length-width ratio, 1.58(1.50–1.74):1.06(1.06–1.10); interocular width, 0.99(0.96–1.04). Antennal segments: I, 0.40(0.38–0.43); II, 0.31(0.30–0.33); III, 0.39(0.36–0.46); IV, 0.47(0.46–0.50); V, 0.47(0.46–0.50). Labial segments: I, 0.59(0.58–0.60); II, 0.84 (0.76–0.93); III, 0.65(0.62–0.73); IV, 0.49(0.48–0.51).

Pronotum: Width-length ratio, 3.32(2.90–3.41):1.77(1.62–1.89).

Scutellum: Length-width ratio, 2.26(2.08–2.60):2.25(2.08–2.72).

Length of body: 6.33(5.68–6.75).

Type data.—The types (USNM) were originally reported by Uhler from "California, and near San Francisco."

Specimens studied.—13 males, 20 females.

United States: *Arizona:* Baboquivari Mts., Boyce Thompson Arboretum (Pinal Co.), Catalina Springs, Tempe, Tucson; March to June. *California:* No exact locality. *Utah:* St. George, Sevier Bridge Reservoir; March, August.

Mexico: *Baja California:* El Rufugio, La Paz, Mesquital, San Ignacio, San José del Cabo, San Pedro; July. *Quintana Roo:* Espírito Santo Island; June. *Sonora:* Guaymas; April.

Discussion.—This very strongly marked species is easily identified, as is attested to by the fact that whenever this name was found attached to a specimen, that specimen was one of this species.

Tominotus curvipes **(Dallas), new combination**

Plate figures 70, 71, 252

Aethus curvipes Dallas, 1851, p. 114.—Walker, 1867, p. 152.—Stål, 1876, p. 25.—Signoret, 1882, p. 39, pl. 2, fig. 81.—Uhler, 1886, p. 3.
Cydnus curvipes Lethierry and Severin, 1893, p. 66.

Diagnosis.—The large size, polished dorsum, and modified hind tibiae (which in both sexes show a distinct curve in apical third and a flattened space ventrally near base) readily distinguish this species.

Description.—Male: Oval.

Head: Length more than half width; 1.59(1.38–1.75):2.55(2.28–

2.73); interocular width, 1.59(1.33–1.70); juga rounded, forming a flattened semicircle, almost as long as clypeus, latter with two subapical setigerous punctures; jugum with a complete, submarginal row of coarse, close-set, setigerous punctures giving rise to long cilia and stout pegs, surface longitudinally depressed either side of clypeus and with scattered minute punctures; ocelli well developed, separated from eye by more than ocellar width; jugum ventrally polished, impunctate; maxillary plate moderately and very closely punctured. Antennal segments: I, 0.55(0.49–0.58); II, 0.68(0.66–0.71); III, 0.59(0.50–0.65); IV, 0.79(0.70–0.86); V, 0.77(0.75–0.81). Bucculae not as high as labial II; labium surpassing middle coxae. Labial segments: I, 1.09(0.91–1.17); II, 1.39(1.20–1.50); III, 1.25(1.03–1.33); IV, 0.89(0.72–1.00).

Pronotum: Width almost twice length, 5.73(5.03–6.07):2.95(2.69–3.26); anterior margin strongly and broadly emarginate; lateral margins entire, with a submarginal row of about 20 setigerous punctures; transverse impression slightly behind midlength, obsolete to absent medially, marked by a single crescentric row of coarse punctures behind anterior emargination and a few (one to five) or no punctures laterally; posterior lobe with a few punctures medially and laterally.

Scutellum: Length equal to or greater than width, 3.78(3.32–4.08): 3.69(3.30–3.90); numerous coarse punctures scattered irregularly over surface except across base and apex, latter sometimes with several minute punctures.

Hemelytron: Corial areas well defined; disc punctured throughout, more obsoletely so medially, two distinct rows of coarse punctures paralleling claval suture; exocorium closely and distinctly punctured for most of its length; costa with six to ten setigerous punctures; clavus with one or two irregular, longitudinal rows of punctures; membranal suture broadly, shallowly concave, lateral angle acute; membrane usually with distinct fuscous clouds between veins.

Propleuron: Shining, with a few coarse punctures above acetabulum, in depression and near posterolateral angle; prosternal carinae about half as high as labial II, abruptly terminated posteriorly.

Mesopleuron: Evaporatorium interrupted on outer half by polished strip along posterior margin of segment; lateral polished area impunctate.

Metapleuron: Evaporatorium occupying more than two-thirds of segment, lateral margin weakly concave; peritreme abruptly terminated; lateral area impunctate.

Sternites: Polished, impunctate, posterior margins sharply and finely crenulate on lateral third or more.

Legs: Posterior legs distinctly modified, femora convex ventrally with a prominent, subapical, conical tubercle, tibiae abruptly and

strongly flattened below near base and conspicuously curved in apical third.

Terminalia: Genital capsule shining, with scattered obsolete and minute punctures; gonostylus as illustrated (fig. 252).

Length of body: 10.01(9.16–10.81).

FEMALE: rather similar to male, but posterior femora with only a weak indication of the subapical tubercle ventrally, tibiae more weakly but still distinctly flattened and curved as described for male. Measurements averaging somewhat smaller.

Head: Length-width ratio: 1.55(1.52–1.59):2.47(2.40–2.53); interocular width, 1.48(1.36–1.59). Antennal segments: I, 0.53(0.50–0.56); II, 0.64(0.63–0.66); III, 0.51(0.50–0.53); IV, 0.73(0.70–0.76); V, 0.78(0.76–0.80). Labial segments: I, 1.05(0.98–1.10); II, 1.39(1.26–1.50); III, 1.25(1.10–1.33); IV, 0.87(0.76–0.93).

Pronotum: Width-length ratio, 5.42(5.24–5.58):2.88(2.70–2.97).

Scutellum: Longer than wide, 3.64(3.45–3.78):3.37(3.30–3.45).

Length of body: 9.88(9.61–10.05).

TYPE DATA.—Dallas' types (BrM) were listed as coming from "Jamaica" and "S. America."

SPECIMENS STUDIED.—4 males, 13 females.

BAHAMAS: Andros Island, May–June, 1904, W. M. Wheeler, 1 female (AmM); W. M. Mann, 1 female (USNM). Cat Island, Arthur's Town, July–Aug., 1935, W. J. Clench, 2 females (MCZ). South Bimini Island, June 20, 1950, Cazier and Rindge, 2 females (AmM, RCF); July, August 10, 15, and 21, 1951, C. and P. Vaurie, 5 females (AmM).

JAMAICA: South of Bug River, Mar. 30, 1906, A. E. Wright, 1 male (MCZ). Port Antonio, 1 male (MCZ); January, A. E. Wright, 1 male, 1 female (AmM). Richmond, Nov. 2, 1 male (USNM). Stoney Hill, M. Bovell–37, 1 female (USNM).

DISCUSSION.—Several interesting types of variation were noted in the small series studied. These included a difference in pronotal punctation, in degree of concavity of anterior pronotal margin, and the size of the ocelli. The pronotal punctation on the specimens from the Bahamas was coarser, impressed, and more abundant in the transverse impression (fig. 70) than on those from Jamaica (fig. 71). The Island of Cuba, lying between the Bahamas and Jamaica, was not represented in the material studied. A series from Cuba compared with specimens from the other two localities should prove interesting. The degree of concavity of the anterior margin of the pronotum (figs. 70, 71) and the variation in ocellar size showed no such geographic arrangement.

Tominotus hogenhoferi (Signoret), new combination

PLATE FIGURES 69, 253

Aethus hogenhoferi Signoret, 1881b, p. 429, pl. 12, fig. 58.—Uhler, 1886, p. 3.
Aethus rogenhoferi Lethierry and Severin, 1893, p. 68.

DIAGNOSIS.—The broad band of setigerous punctures along the sides of the pronotum plus the impunctate abdomen will identify this species within the genus.

DESCRIPTION.—MALE: One specimen. Oval.

Head: Length more than half width, 1.43:2.05; interocular width, 1.43; juga rounded, forming a flattened semicircle, as long as clypeus, latter with two subapical setigerous punctures giving rise to a row of stout pegs with numerous long cilia scattered between and mesally; surface flattened, vertex and clypeus smooth, juga with numerous prominent punctures which converge toward margins; ocelli small, removed from eyes by about twice an ocellar width; jugum ventrally impunctate; maxillary plate with several coarse punctures. Antennal segments: I, 0.53; II, 0.50; III, 0.53; IV and V missing. Bucculae as high as antennal II, almost semicircular; labium reaching between middle coxae. Labial segments: I, 0.95; II, 1.23; III, 0.93; IV, 0.76.

Pronotum: Length more than half width, 3.01:5.08; anterior margin broadly and deeply emarginate; lateral margins entire, not emarginate, with a broad, submarginal line of many setigerous punctures (fig. 69); transverse impression at midlength, vague, marked by an irregular row of moderate punctures; anterior lobe polished, impunctate except for a few punctures laterally; posterior lobe polished, with a few scattered punctures finer than those of transverse impression.

Scutellum: Little longer than wide, 3.45:3.31; surface smooth, with numerous well-separated punctures becoming fine apically; apex broadly rounded, wider than half of membranal suture.

Hemelytron: Corial areas well defined; surface polished and punctures scattered, fine on apical half, becoming coarser toward base and in two rows paralleling claval suture; radial vein with an irregular row of fine punctures; clavus with three partial rows of punctures; costa with 14 or 15 setigerous punctures; membranal suture weakly bisinuate, rounded at lateral angle; membrane surpassing apex of abdomen, with prominent, rounded, premedian fuscous spot.

Propleuron: Punctured only at anteroventral angle, ventrally in depression and in posterolateral angle; prosternal carinae prominent, sharp, abruptly terminated ventrally.

Mesopleuron: Evaporatorium with marginal polished band separating it from posterior margin of segment; latter entire.

Metapleuron: Evaporatorium occupying more than half of segment;

peritreme extending more than half way across segment, becoming evanescent apically.

Legs: Moderately long, not unusually modified.

Sternites: Polished, impunctate or with a few fine punctures laterally.

Terminalia: As illustrated (fig. 253).

Length of body: 8.54.

FEMALE: Two specimens. Similar to male, except sometimes the outer row of punctures paralleling claval suture is incomplete; measurements larger.

Head: Length-width ratio, 1.43(1.43–1.43):2.25(2.22–2.28); interocular width, 1.50(1.50–1.51). Antennal segments: I, 0.58(0.56–0.60); II, 0.54(0.53–0.56); III, 0.57(0.53–0.61); IV, 0.75(0.72–0.78); V, 0.78(??–0.78). Labial segments: I, 0.98(0.93–1.04); II, 1.28(1.23–1.33); III, 1.01(0.93–1.10); IV, 0.81(0.80–0.83).

Pronotum: Length-width ratio, 2.97(2.95–2.99):5.46(5.38–5.55).

Scutellum: Length-width ratio, 3.45(3.29–3.61):3.53(3.44–3.61).

Length of body: 9.64(9.38–9.90).

TYPE DATA.—The two specimens (Wien) on which Signoret based his original description were loaned for study. They are in a somewhat poor condition but clearly recognizable. The specimen from Mexico bearing the type label is here designated lectotype. The other specimen is labeled "Guatemala, Escuintla." On both specimens the trivial name begins with the letter "R" instead of the "H" which appeared in the original citation. The type localities as given with the original description were simply "Guatemala, Mexico".

SPECIMENS STUDIED.—2 males, 3 females.

MEXICO: *No exact localities:* 1 male (USNM), 1 male (Wien). *Colima:* 2 females (USNM).

GUATEMALA: Escuintla, 1 female (Wien).

DISCUSSION.—Each of the three nontype specimens examined had been determined by a different worker, but all were labeled "*Aethus hogenhoferi.*"

The present author considers the use of the initial "R" in the trivial name by Lethierry and Severin an unnecessary emendation from the letter "H" which appeared in the original description.

Tominotus impuncticollis (Distant), new combination

PLATE FIGURES 82, 254

Pangaeus impuncticollis Distant, 1880, p. 7, pl. 3, fig. 7.
Aethus impuncticollis Signoret, 1881b, p. 428, pl. 12, fig. 57.
Cydnus impuncticollis Lethierry and Severin, 1893, p. 66.

DIAGNOSIS.—This species may be recognized by the broad scutellar apex and the absence of distinct punctures laterally on pronotal disc.

Description.—Male: Oval.

Head: Length about two-thirds width, 1.29(1.24–1.36):1.92(1.89–2.01); interocular width, 1.41(1.36–1.43); anterior outline a slightly truncated semicircle, clypeus almost as long as juga, narrowed apically, with two subapical setigerous punctures; submarginal setigerous punctures bearing full row of stout pegs and few long hairs; surface flattened, obsoletely punctate, moderate rugae radiating from eyes by space greater than three times transverse ocellar width; jugum ventrally and maxillary plate impunctate. Antennal segments: I, 0.44(0.41–0.50); II, 0.39(0.36–0.41); III, 0.48(0.45–0.50); IV, 0.57(0.55–0.60); V, 0.62(0.61–0.64). Bucculae higher than labial II, almost semicircular; labium reaching between middle coxae. Labial segments: I, 0.67(0.63–0.83); II, 0.98(0.96–1.00); III, 0.84(0.80–0.96); IV, 0.65(0.63–0.66).

Pronotum: Length more than half width, 2.56(2.50–2.70):4.67(4.56–4.76); anterior margin deeply, roundly emarginate; lateral margin entire, not emarginate, with submarginal row of 20 to 23 setigerous punctures; transverse impression absent or weakly indicated laterally; disc with few widely scattered, very fine punctures.

Scutellum: Length usually slightly greater than width, 3.07(3.00–3.15):2.96(2.85–3.01); discally with few scattered, moderate punctures.

Hemelytron: Clavus and corium polished; clavus with irregular row of punctures; mesocorium with obsolete, fine punctures becoming slightly more distinct basally, row paralleling claval suture represented by few, usually separated punctures; exocorial punctation stronger, more abundant than that on mesocorium; costa with four setigerous punctures; membranal suture nearly straight (fig. 82); membrane reaching base of abdomen.

Propleuron: Shining, with distinct punctures in depression and above acetabulum; prosternal carinae less than half as high as labial II, truncated posteriorly.

Mesopleuron: Evaporatorium interrupted posteriorly by polished band; lateral area roughly rugopunctate.

Metapleuron: Lateral margin evaporatorium concave; lateral area coarsely punctate near evaporatorium.

Legs: Not unusually modified.

Sternites: Smooth, punctate only laterally.

Terminalia: Genital capsule shining, with few scattered, distinct punctures, apical margin almost straight; gonostylus as illustrated (fig. 254).

Length of body: 8.55(8.40–8.70).

Type data.—Distant's (1880) types (BrM) are from "Mexico; Panama."

Specimens studied: 5 males.

Mexico: *Na exact localities:* 1 male (USNM) labeled *Ectinopus holomelas* and *Aethus impuncticollis* and 1 male (USNM) labeled *Aethus impuncticollis* by Linell. *Distrito Federal:* Lomas de Chapultepec, June 28, 1932, 1 male (RLU). *Hidalgo:* 5 miles north of Tizayuca, Nov. 13, 1946, E. S. Ross, 2 males (CalAc).

Discussion.—Distant's statement in the original description that the margins of the pronotum "are sparingly fringed with long hairs" may have been true of his specimens, but the great number of setigerous punctures indicate that 20 or more hairs should be present in unrubbed specimen.

Tominotus inconspicuus, new species

Plate figure 258

Diagnosis.—Among those species of the genus which measure less than 6 mm. in length, this one may be recognized by the lack of subapical setigerous punctures on the clypeus and the few (two to six) setigerous punctures on the costa.

Description.—Male: Oval.

Head: Length about two-thirds width, 0.81(0.80–0.86):1.29(1.26–1.37); interocular width, 0.79(0.76–0.83); anterior outline semicircular, clypeus equalling juga, narrowed apically, without subapical setigerous punctures; juga with complete row of submarginal, setigerous punctures bearing full row of pegs and few hairs between; surface shining, impunctate or with very few widely scattered, fine punctures; ocelli moderate, separated from eye by space almost twice ocellar width; jugum ventrally and maxillary plate (except basally) shining, impunctate. Antennal segments: I, 0.24(0.23–0.26); II, 0.24(0.23–0.26); III, 0.29(0.27–0.32); IV, 0.36(0.34–0.39); V, 0.41(0.40–0.43). Bucculae almost as high as labial II, evanescent posteriorly; labium reaching between middle coxae. Labial segments: I, 0.41(0.40–0.43); II, 0.64(0.60–0.71); III, 0.50(0.47–0.55); IV, 0.37(0.37–0.38).

Pronotum: Length about half width, 1.33(1.30–1.40):2.60(2.40–2.73); anterior margin moderately emarginate; lateral margins entire, straight on middle third or more, with submarginal row of seven or eight setigerous punctures; transverse impression slightly impressed, obsolete at middle, marked by medially interrupted row of close-set punctures; anterior lobe with large and fine punctures intermixed laterally and in subapical, depressed row; posterior lobe with very widely scattered punctures somewhat more numerous medially.

Scutellum: Length greater than width, 1.75(1.69–1.88):1.65(1.60–1.71); impunctate basally, discal punctation becoming finer and closer toward narrowed apex.

Hemelytron: Clavus and corium polished; clavus with one complete and one partial row of punctures; mesocorium with two rows of punc-

tures paralleling claval suture, discally with fine scattered punctures becoming denser and coarser basally and sometimes apically; exocorium more uniformly and closely punctate; costa with two (one specimen with three on one side) setigerous punctures; membranal suture straight, lateral angle not produced; membrane surpassing apex of abdomen.

Propleuron: Shining, with few punctures in depression and above acetabulum.

Mesopleuron: Evaporatorium reaching lateral margin; lateral area impunctate.

Metapleuron: Lateral margin of evaporatorium straight; lateral area impunctate.

Legs: Not specially modified.

Sternites: Shining, impunctate, more or less rugopunctate in spiracular area.

Terminalia: Genital capsule shining, with few fine punctures laterally, apical margin sinuate medially; gonostylus as illustrated (fig. 258).

Length of body: 5.10(4.87–5.44).

Female: Similar to male.

Head: Length-width ratio, 0.85(0.79–0.92):1.31(1.23–1.37); interocular width, 0.81(0.78–0.87). Antennal segments: I, 0.27(0.25–0.33); II, 0.24(0.22–0.30); III, 0.28(0.26–0.31); IV, 0.33(0.31–0.36); V, 0.40(0.36–0.43). Labial segments: I, 0.44(0.40–0.51) II, 0.64(0.62–0.66); III, 0.45(0.43–0.49); IV, 0.36(0.34–0.41).

Pronotum: Length-width ratio, 1.40(1.31–1.52):2.66(2.53–2.86).

Scutellum: Length-width ratio, 1.76(1.62–1.88):1.67(1.56–1.82).

Length of body: 4.97(4.89–5.39).

Type data.—Holotype male (Car) and allotype female (Car), "Taperina, Brazil, Acc. No. 2966." Paratypes as follows:

Brazil: Taperina, 4 males, 4 females (Car, USNM). Santarém, 2 males, 2 females (Car). Natal, Mann, 1 femal (MCZ). No exact locality ("Brasil, S. Am."), 1 male, 1 female (AmM).

Argentina: La Plata, Spegessini, 1 female (MCZ); 2 males, 1 female (UnivNac); C. Bruck, 2 females (UnivNac); A. R. Bezzi, 1 male (UnivNac). "Pucapampa," December 1919, Weiser, 1 female (BrM). Río Negro (Menafra), Tremolera and Jorgensen, 3 males, 4 females (UnivNac, RCF). Buenos Aires, C. Bruck, 1 female (UnivNac). Río Luján, Buenos Aires Province, Nov. 19, 1939; Biraben-Bezzi, 1 female (UnivNac). Palado, Buenos Aires Province, Sept. 20, 1942. Torres, 1 male (UnivNac). Rosario, Santa Fé Province, 1 female (UnivNac).

Discussion: The specific name refers to the lack of outstanding features to make this form conspicuous among other species of the genus.

Tominotus laeviculus (Berg), new combination

PLATE FIGURE 255

Cydnus laeviculus Berg, 1879, p. 11.
Aethus insularis Signoret, 1882, p. 37, pl. 2, fig. 78.
Aethus distinctus Signoret, 1882, p. 37, pl. 2, fig. 79. New synonymy.
Cydnus insularis Lethierry and Severin, 1893, p. 66.

DIAGNOSIS.—The small size (body length 3.7–4.5) and the presence of two setigerous punctures subapically on the clypeus will mark this species from its congeners.

DESCRIPTION.—MALE: Elongate-oval, costa subparallel on basal half.

Head: Length almost two-thirds width, 0.74(0.71–0.81):1.10(1.02–1.16); interocular width, 0.69(0.63–0.73); anterior outline semicircular, clypeus as long as juga, narrowed apically and with two subapical setigerous punctures; jugum with a complete, submarginal row of setigerous punctures bearing a row of stout, blunt pegs and few hair-like setae between; surface shining, with few distinct, oblique rugae, punctation becoming coarser and more abundant towards margins; ocelli well developed, separated from eyes by space nearly twice transverse ocellar width; jugum ventrally and maxillary plate, except basally, polished, impunctate. Antennal segments: I, 0.21(0.16–0.24); II, 0.18(0.16–0.20); III, 0.24(0.23–0.26); IV, 0.27(0.26–0.30); V, 0.34(0.33–0.36. Bucculae almost as high as labial II; labium reaching between middle coxae. Labial segments: I, 0.37(0.35–0.40); II, 0.52(0.50–0.61); III, 0.42(0.41–0.43); IV, 0.34(0.33–0.36).

Pronotum: Length about half width, 1.17(1.10–1.21):2.27(2.11–2.40); anterior margin deeply, doubly emarginate; lateral margins entire, straight on basal half, with submarginal row of seven to ten setigerous punctures; transverse impression moderately impressed, obsolete medially, marked by regular, medially interrupted row of punctures; punctation of anterior lobe restricted to broad lateral area and subapical line; posterior lobe with scattered fine and coarse punctures.

Scutellum: Length little greater than width, 1.46(1.36–1.56):1.40 (1.29–1.49); polished; almost impunctate across base, discally with numerous scattered punctures becoming slightly finer toward apex.

Hemelytron: Clavus and corium polished; clavus with one complete and basal half of second row of punctures; corium with numerous punctures becoming larger and more crowded basally; costa with two to four setigerous punctures; membranal suture virtually straight, lateral angle not produced; membrane surpassing apex of abdomen.

Propleuron: Shining, with few punctures in depression; prosternal carinae about half as high as labial II.

Mesopleuron: Evaporatorium following posterior margin to lateral

margin, thence continued forward along lateral margin; lateral area impunctate.

Legs: Not specially modified.

Sternites: Shining, impunctate except in spiracular area.

Terminalia: Genital capsule shining, with few punctures in lateral angles, apical margin slightly sinuate medially; gonostylus as illustrated (fig. 255).

Length of body: 4.27(4.08–4.50).

FEMALE: Similar to males.

Head: Length-width ratio, 0.74(0.70–0.78):1.10(1.03–1.15); interocular width, 0.70(0.66–0.73). Antennal segments: I, 0.21(0.20–0.23); II, 0.18(0.16–0.20); III, 0.24(0.23–0.26); IV, 0.29(0.26–0.30); V, 0.35(0.35–0.36). Labial segments: I, 0.37(0.34–0.40); II, 0.57 (0.53–0.61); III, 0.41(0.38–0.43); IV, 0.33(0.32–0.36).

Pronotum: Length-width ratio, 1.14(0.97–1.21):2.20(2.00–2.31).

Scutellum: Length-width ratio, 1.42(1.31–1.56):1.37(1.23–1.49).

Length of body: 4.16(3.74–4.35).

TYPE DATA.—Berg's type, which is apparently lost, was reported to be from Buenos Aires. Signoret indicates that his type had come from Montevideo, Uruguay.

SPECIMENS STUDIED.—8 males, 10 females.

BRAZIL: Baixa Verde, Rio Grande do Norte, Mann, 1 male (MCZ). Chapada, July and August, 6 males, 6 females (Car). Estancia Sergipes, December 1929, R. C. Shannon, 1 female (USNM). Nova Teutonia, Santa Catarina, Aug. 26, 1950, Nov. 28, 1950, F. Plaumann, 2 females (JCL). Pará, July, 1 male, 1 female (Car).

DISCUSSION.—This is the form which Signoret (1882, p. 37) synonymized under *C. insularis* Westwood after a study of the type of Berg's *laeviculus*. Such assignment is not tenable, as Dr. Graham's helpful notes reveal that the type of *insularis* Westwood has an incomplete row of setigerous punctures on the submargin of the jugum, thus not agreeing with Signoret's definition and causing it to be placed in the genus *Dallasiellus* in the present study (footnote 9, p. 573). However, in the absence of Berg's type, the author is accepting Signoret's association of Berg's species with this form.

Although the author has not seen the type of *Aethus distinctus* Signoret, that species is synonymized here because of a reluctance to accept Signoret's species when they are separated from closely allied forms on the basis of the osteolar peritreme. Sufficient evidence is available in other parts of the family (i.e., his separation of *Aethus politus* from *A. communis*, of *Pangaeus vicinus* from *P. bilineatus*, and other examples) to cause one to question the accuracy of his observations on this structure. Study of the type may refute this conclusion.

Tominotus signoreti (Mulsant and Rey), new combination

PLATE FIGURES 6, 35, 80, 111, 117, 140, 256

Cydnus (*Tominotus*) *signoreti* Mulsant and Rey, 1866, p. 319.
Cyrtomenus constrictus Berg, 1879, p. 277.
Aethus (*Tominotus*) *constrictus* Signoret, 1881b, p. 427, pl. 12, fig. 56.
Cydnus signoreti Lethierry and Severin, 1893, p. 68.

DIAGNOSIS.—The broad scutellar apex, the single, lateral submarginal row of setigerous punctures and the unicolorous corium and legs combine to separate this species from others within the genus. The pronotal constriction shown by the males is the deepest and most abrupt found in any cydnid of the Western Hemisphere.

DESCRIPTION: Based on a single male and a single female. MALE: Rounded oval.

Head: Length about two-thirds width, 1.00:1.46; interocular width, 1.06; outline semicircular, eyes projecting by about one-third their width; juga shining, with faint radiating rugae; surface, including base of clypeus, faintly alutaceous, with scattered minute punctures; clypeus with two subapical setigerous punctures; juga with submarginal row of setigerous punctures bearing only long cilia, no pegs; juga ventrally and maxillary plate polished, impunctate. Antennal segments: I, 0.23; II, 0.25; III, 0.30; IV, 0.33; V, 0.33. Bucculae low, evanescent posteriorly (fig. 35); labium reaching between middle coxae (as in female?). Labial segments: I, 0.56; II–IV missing.

Pronotum: Width more than twice length, 3.32:1.56; anterior margin deeply bimarginate; side margins very deeply and abruptly constricted opposite ends of transverse groove (fig. 6), with single, submarginal row of 25 to 27 setigerous punctures, one setigerous puncture near base set mesad of this row; transverse groove absent; anterior lobe laterally with broad area of prominent punctures; posterior lobe, except hind margin, punctured across width.

Scutellum: Distinctly wider than long, 2.28:1.75; triangular, apex not narrowed (fig. 80); impunctate basally, discally with numerous, close-set, moderate punctures becoming finer posteriorly.

Hemelytron: Corial areas well defined, alutaceous and rather uniformly punctured on discal and exocorial areas with two rows of closer set punctures paralleling claval suture; clavus finely alutaceous, with irregular rows of fine punctures; costa with 13 to 15 punctures; membranal suture bisinuate; membrane longer than basal width, somewhat surpassing apex of abdomen.

Propleuron: Impunctate; prosternal carinae prominent, thick, calloused, abruptly and rectangularly terminated ventrally.

Mesopleuron (fig. 111): Evaporatorium interrupted by a broad polished band along posterior margin.

Metapleuron (fig. 111): Evaporatorium occupying almost mesal half of segment, lateral margin well defined, deeply concave.

Sternites: Shining, very weakly alutaceous, weakly and finely rugose and punctured laterally.

Terminalia: Genital segment marginally carinate and slightly expanded; gonostylus as illustrated (fig. 256).

Length of body: 5.14.

FEMALE: Generally similar to male but lacking constriction of pronotal side margins and the extra pronotal setigerous puncture in the posterior angle mesad of the submarginal row; measurements (in the single female studied) slightly smaller than those of male.

Head: Width-length ratio, 1.43:0.96; interocular width, 1.00. Antennal segments: I, 0.33; II, 0.26; III, 0.28; IV and V missing. Labial segments: I, 0.56; II, 0.64; III, 0.53; IV, 0.43.

Pronotum: Width-length ratio, 3.26:1.43.

Scutellum: Width-length ratio, 2.08: 1.69.

Length of body: 5.00.

TYPE DATA: Mulsant and Rey originally gave their type locality as "Montpellier," France, but Signoret (1881b, p. 428) later pointed out their misinterpretation of his label "Mont.," which he said stood for Montevideo in Uruguay. Berg gave the type locality for *constrictus* as Provincia Bonaerensis, Argentina. The author has been unsuccessful in locating the type of *signoreti* but has learned that Berg's type is in the Universidad Nacional de La Plata, Buenos Aires.

SPECIMENS STUDIED: 1 male, 1 female.

PARAGUAY: San Bernardino, Fiebrig, 1 male, 1 female (Wien).

DISCUSSION.—See discussion under the genus.

Tominotus unisetosus, new species

PLATE FIGURE 257

DIAGNOSIS.—Among its congeners with the uninterrupted mesopleural evaporatorium, this species may be recognized by the single setigerous puncture on the costa.

DESCRIPTION.—MALE: Elongate, subparallel.

Head: Width one-half greater than length, 1.26(1.16–1.36):0.87 (0.86–0.90); interocular width, 0.80(0.80–0.83); juga semicircular, converging but not contiguous beyond apex of clypeus; latter with two setigerous punctures subapically; juga with submarginal punctures giving rise to peglike setae anteriorly and long slender setae basally; surface faintly to distinctly rugose radially, with numerous rounded, wide, shallow punctures; vertex with punctures minute or absent; ocelli well developed, removed from eye by more than ocellar width; jugum ventrally polished, impunctate; maxillary plate with few punc-

tures posteriorly. Antennal segments: I, 0.26(0.26–0.27); II, 0.33 (0.30–0.36); III, 0.34(0.33–0.36); IV, 0.41(0.40–0.46); V, 0.48(0.46–0.50). Bucculae as high as labial II; labium reaching between middle coxae. Labial segments: I, 0.48(0.46–0.50); II, 0.67(0.66–0.70); III, 0.59(0.53–0.68); IV, 0.43(0.40–0.46).

Pronotum: Width about twice length, 2.60(2.40–3.06):1.32(1.23–1.39); anterior margin strongly emarginate; side margins convex, not sinuate nor constricted at ends of transverse groove, more abruptly narrowed anteriorly; lateral submarginal row with six or seven setigerous punctures; transverse groove weak, marked by a row of close-set, prominent punctures; anterior lobe impunctate discally, with an irregular double row of prominent punctures and numerous minute ones; submarginally at apex between eyes and laterally with numerous punctures similar to those of transverse groove; posterior lobe polished, with few scattered, moderate punctures and more numerous minute ones on median disc and laterally.

Scutellum: Distinctly longer than broad, 1.83(1.69–2.06):1.64(1.56–1.82); triangular, apex narrowed; disc with numerous distinct, irregularly placed punctures except on basal fifth and on apex.

Hemelytron: Corial areas well defined, polished; mesocorium with numerous punctures, these obsolete on middle third, coarser and closer set in two rows paralleling claval suture; exocorial area distinctly, closely and rather irregularly punctured throughout; costa with a single, subbasal, setigerous puncture; clavus with a disrupted, submedian row of distinct, close-set punctures; membranal suture straight; membrane slightly surpassing apex of abdomen, length and basal width subequal.

Mesopleuron: Evaporatorium extensive, reaching posterolateral angle of segment and prolonged forward along side margin; posterior margin finely crenulate.

Metapleuron: Evaporatorium occupying more than mesal three-fourths of segment, obliquely and abruptly separated from impunctate lateral polished area.

Sternites: Shining, impunctate, irregularly sculptured with obsolete to distinct longitudinal rugae.

Terminalia: Subgenital plate with apical margin slightly flaring and broadly, deeply, sinuate at middle apex; gonostyli as illustrated (fig. 257).

Length of body: 4.88(4.57–5.28).

Female: Very similar to male, measurements averaging larger.

Head: Width-length ratio, 1.33(1.30–1.40):0.89(0.86–0.93); interocular width 0.82(0.81–0.86). Antennal segments: I, 0.27(0.26–0.30); II, 0.33(0.30–0.36); III, 0.33(0.30–0.36); IV, 0.44(0.40–0.46);

V, 0.54(0.46–0.60). Labial segments: I, 0.47(0.46–0.50); II, 0.73(0.66–0.76); III, 0.59(0.56–0.65); IV, 0.44(0.43–0.47).

Pronotum: Width-length ratio, 2.64(2.47–2.79):1.40(1.30–1.49).

Scutellum: Length-width ratio, 1.99(1.89–2.15):1.64(1.56–1.82).

Length of body: 4.95(4.57–5.28).

TYPE DATA.—Holotype male (USNM 64428) and allotype female (USNM), both labeled "Brownsville, Tex., Mar. 14, 1936, P. A. Glick, col., cotton on roots in soil." Paratypes as follows:

UNITED STATES: *Texas:* Austin, Mar. 1, 1901, 1 male (USNM), Aug. 24, 1927, D. Rockefeller Exp., Gertsch, 1 female (AmMus). Bexar Co., from spoil, peach orchard, W. F. Turner, 1 male (labeled "*Aethus* sp. det. H. G. Barber"), 2 females; Nov. 9, 1938, 9019, 1 female, Mar. 1937, 3385, 1 female; Mar. 27, 1932, under litter, T 3282, 1 female; May 5, 1938, 11D–14, 1 female; July 16, 1937, 5446, 1 male; Nov. 6, 1936, 1 female (all USNM, same collector). Brazos Co., 1 female (MCZ). Brownsville, June, 3 females (one labeled "*Homaloporus* sp. perhaps *pangaeformis* Sign., det. E. P. Van Duzee") (KU); same data, double mount of 2 females (one labeled "*Pangaeus bilineatus* Say," and the other "*Aethus* n. sp., det. H. G. Barber") (USNM); same data, double mount of 2 females (labeled "*Rhytidoporus* sp.," in Van Duzee's handwriting) (CalAc); Oct. 1942, E. S. Ross, at light, 3 females (CalAc); June 1903, 1 female with determination of "*Cydnus communis*" crossed out (USNM); June 11–16, 1938, Darlington, 2 females (MCZ); March 3, 4, 10, 11, 14, 1936, cotton on roots in soil, 6 females, 2 nymphs (USNM); 1929, 1 female (USNM); 1929, 1 female (with determination "*Cydnus communis*" crossed out) (USNM). Del Rio, July 8, 1938, R. I. Sailer, 1 female (USNM). Harlingen, Sept. 1, 1945, D. E. Hardy, 1 female (S1). Hidalgo Co., June 6, 1930, J. C. Gaines, Tex. Exp. Sta. light trap, 4 females (one labeled "*Aethus* sp.") (HMH, RCF). Runge, Sept. 24, 1906, 1 female, nighthawk stomach (USNM). San Angelo, Tom Green Co., June 28, 1948, C. and P. Vaurie, 1 female (AmMus). San Antonio, July 7, 1942, E. S. Ross, 1 female (CalAc). San Juan, June 28, 1939, L. W. Hapner, 1 female (KU). Uvalde, Aug. 4, 1937, D. J. and J. N. Knull, 1 female (JCL). No exact locality, Mar. 27, 1900, 1 male (labeled "*Geotomus parvulus*," second label with note by Van Duzee, "does not agree") (USNM); February, A. L. Melander, 1 female (labeled "*Pangaeus* sp.") (HMH).

MÉXICO: *Guerrero:* 3 miles north of Chilpancingo, Nov. 18, 1946, 1 female (CalAc). *Jalisco:* Volcán de Colima, L. Conrad, 1 female (USNM). *México:* Tejupilco, June 16, 1933, H. E. Hinton, R. L. Usinger, 3 males, 5 females (RLU, RCF). *Morelos:* Cuernavaca, June, 1 male (RCF). "Temixco," June 13, 1941, 1350, Bolívar, Osorio, 1 female (Pel). *Oaxaca:* Tuxtepec, J. Canelo, May 21, 1934, #894, 1 female (USNM). *San Luis Potosí:* 18 miles south of Tamazunchale, Nov. 22, 1946, E. S. Ross, 1 female (CalAc). *Yucatán:* Merida, July 29, 1952, J. and D. Pallister, 2 females (AmM).

GUATEMALA: 70 miles east of Guatemala City, May 8, 1947, R. R. Miller, 1 female (USNM). Panzós, July 17, 1947, C. and P. Vaurie, 1 female (AmM).

COSTA RICA: Bebedero, June 12–July 4, 1930, E. Reimoser, 17 females (Wien, RCF), E. Reimoser, 1 male, 5 females (Wien). San Isidro, E. Reimoser, 1 female (USNM). No exact locality, intercepted at Philadelphia on banana, Oct. 1, 1905, F. K. Knab, 1 female (USNM).

DISCUSSION.—That such a common species should not have been described previously is quite surprising. However, the confusion that seems to permeate the studies of this family is very evident from the

variety of determinations listed above, even to the extent of one hemipterist placing specimens of one series under two generic names.

The present species shows very little variation except in the abundance of punctures laterally on the anterior pronotal lobe. An unusual number of specimens, all from Texas, bore ecological data with such notes as "cotton, in roots in soil," "at light," "from soil," "peach orchard," and "nighthawk stomach."

Genus *Dallasiellus* Berg

Stenocoris Signoret, 1880, p. xliv (nec Burmeister, 1839, p. 1010, in hemipterous family Coreidae; nec Rambur, 1839, p. 139, in hemipterous family Lygaeidae).
Dallasia Bergroth, 1891, p. 235 (nec Stokes, 1886, p. 534, in Protozoa).
Dallasiellus Berg, 1901, p. 281.
Colobophrys Horváth, 1919, p. 244. New synonymy.
Geocnethus Horváth, 1919, p. 245 (in part). New synonymy.

Diagnosis.—This genus is best recognized among those cydnid genera of the Western Hemisphere that lack a differentiated terminal lobe of the osteolar peritreme by the incomplete, submarginal row of setigerous punctures on the juga and the absence of a subapical, impressed line on the pronotum.

Description.—Size small to large, 3.7 to 11.5; form oval to parallel-sided; dorsum less strongly convex than venter.

Head: Length more than half width; eyes weakly to strongly projecting; juga as long as or longer than clypeus and convergent in front of it; surface more or less flattened, with no punctures, scattered punctures or coarse confluent punctures; margin with or without fine dorsal carina; ocelli small to moderate, situated on or posterior to line connecting hind margins of eyes; antennae 5-segmented, relative lengths of segments variable, I usually shortest and V usually longest; bucculae moderately to very high, reaching nearly or quite to base of head; labium reaching from between middle coxae to third sternite, II longest, I or IV shortest.

Pronotum: Width less than to more than twice the length; side margins usually narrowed from base, with submarginal row of setigerous punctures; anterior margin moderately to deeply concave; transverse impression median or postmedian, weakly to strongly impressed; posterior margin broadly but shallowly convex.

Scutellum: Longer than broad, apex narrowed, less than half of membranal suture; disc with or without punctures.

Hemelytron: Corial areas well defined, membranal suture straight or sinuate, lateral angle prolonged or not; corial punctation variable; membrane less than half of hemelytral length, reaching or surpassing apex of abdomen.

Propleuron: Punctate or not; prosternal carinae moderately to very strongly elevated and lobulate.

Mesopleuron: Nearly flat; evaporatorium restricted (fig. 106) or extending into posterolateral angle of segment (figs. 105, 107); mesosternum convex, more or less carinate and haired medially.

Metapleuron: Convex; osteolar peritreme without modified terminal lobe (figs. 106, 107); evaporatorium occupying mesal two-thirds or three-fourths of segment; lateral area with few or no punctures.

Legs: Moderately long; anterior tibia (fig. 129) not surpassing tarsal insertion; posterior tibia (fig. 150) terete, usually simple, in some males (chiefly in the new subgenus *Pseudopangaeus*) ventrally with subbasal emargination distad of which is a decided angle (fig. 149).

Sternites: Polished or alutaceous, impunctate or with few punctures laterally; posterior margins of segments finely denticulate or crenulate.

Terminalia: Male genital capsule with apical rim entire or variously emarginate.

Type of genus.—Signoret proposed *Stenocoris* monobasically for *Aethus longulus* Dallas (1851, p. 119). Since that generic name had been used previously by Burmeister in the hemipterous family Coreidae and by Rambur in the hemipterous family Lygaeidae, Signoret's application of it was invalid. Bergroth recognized this and proposed for it the new name *Dallasia*. Unfortunately, this name was also preoccupied, this time by Stokes in Protozoa so it became necessary for Berg to propose yet another name, *Dallasiellus*, for Signoret's genus. Because both of these new names were proposed to replace *Stenocoris* of Signoret, they must both take *Aethus longulus* Dallas as genotype by objective synonymy. The genotype of *Colobophrys* Horváth is *Colobophrys solitaria* Horváth (1919, p. 244) by original designation. The genotype of *Geocnethus* Horváth is the African species *Geocnethus obesus* Horváth (1919, p. 248) by original designation. Although none of the species of the Western Hemisphere is congeneric with *Geocnethus*, this name enters the American list because Horváth, in proposing it as new, assigned a number of American species to it. In this he has been followed by subsequent authors.

Distribution.—From Washington and Idaho south through Central America into South America as far as Argentina, and eastward in the Gulf States of the United States and into the West Indies.

Discussion.—Of all the genera of Cydnidae occurring in the Western Hemisphere, this genus is the least satisfactorily defined. It is a "residual area" of relatively little specialization, a "dumping ground" to receive those species which do not fit into any of the more strongly marked genera previously separated in the key.

The reasons for synonymizing the generic names of *Stenocoris* Signoret and *Dallasia* Bergroth were given above, both having been preoccupied.

Colobophrys Horváth is here relegated to synonymy because the genotype presents no features which the author considers to be of generic importance for separating it from *Dallasiellus*. In fact, *Colobophrys* is here considered to be the same as the nominal subgenus. Horváth had pointed out that he considered his genus to be close to *Macroscytus* to which it was related by the "marginatis pronoti postice abbreviatus." Actually this statement was misleading not only to the reader but also to Horváth himself. In none of the specimens of Cydnidae examined by the author, not even *Macroscytus*, has there been any shortening of the lateral pronotal margins. In *Macroscytus* the posterior part of the lateral pronotal margin is evanescent and hidden from dorsal view by the laterally swollen umbones; but nevertheless, it does extend to the posterior margin of the segment. Horváth based *Colobophrys* on a new species, *C. solitaria,* which he described from a single female. Through the kind cooperation of Drs. Soos and Halaszfy, of the Musée d'Histoire Naturelle de la Hongrie, this type was made available for study. In this type, as well as in other specimens of the species, the lateral pronotal margin is evanescent posteriorly but is visible for its full length because the umbones are not swollen laterally. The evanescence of the posterior part of the lateral margin results in the greatest pronotal width being distinctly antebasal. This latter situation also is evident in *D. californicus* and to a much lesser degree in the new species *Dallasiellus puncticeps*. *D. puncticeps* and *D. solitaria* agree in one feature, the coarsely rugopunctate cephalic punctation, which sets them apart from all other members of the genus. But surely this cannot be interpreted as being of generic value in any part of the Cydnidae because this extreme as well as the opposite and all intermediates occurs in many parts of the family. Horváth did not know the male of his lone species of *Colobophrys* so he was unable to point out the sexual dimorphism that occurs in *Dallasiellus solitaria*. The males differ markedly from the females in possessing a peculiar, submedian emargination in the lateral pronotal margin. This emargination is marked by a peculiar "fold" which appears to send an oblique furrow mesally, as shown in the illustration of the male pronotum of *D. americanus* (fig. 78). If this pronotal "fold" is believed to have value as a generic indicator, these two species must be grouped together in one genus. But the present author cannot bring himself to agree with establishing genera in the Cydnidae on secondary sexual characters, preferring to believe that the presently offered generic arrangement, based primarily on modifications of the osteolar peritreme and

secondarily on other features possessed by groups of species, gives a truer picture of relationships than any other system offered. This arrangement has the additional merit of keeping to a minimum the number of monobasic genera in this morphologically homogeneous family.

All American species of *Dallasiellus* differ from the type species of *Geocnethus* Horváth (*G. obesus* Horváth) in that the metapleural evaporatorium is complete, while in *Geocnethus obesus* it has an anterior, submarginal, polished band (suggestive of *Rhytidoporus*) extending laterally from the tip of a fold just anterior to the apex of the osteolar peritreme. All Western Hemisphere species that have been described in *Geocnethus* fit readily into *Dallasiellus* as here defined.

Dallasiellus contains three major groups of species that grade into each other by transitional combinations of structural details, thus preventing the establishment of full genera. To point out this grouping, the author has felt obligated to divide the genus into three subgenera which may be separated by the following key:

Key to the subgenera of *Dallasiellus* [9]

1. With the combination of very coarse, widely separated crenulations sublaterally on posterior margin of mesopleuron, and a transverse, submarginal, polished band interrupting mesopleural evaporatorium posteriorly (fig. 106) (male hind tibia with strong, subbasal angulation on posteroventral margin as in fig. 148) . . . . **Pseudopangaeus,** new subgenus (p. 573)
   Without the combination of coarse crenulations and posterior interruption mentioned above, usually with neither (male hind tibia never with subbasal ventral angulation) 2
2. Margin of jugum with fine, marginal carina dorsally from eye to apex. **Dallasiellus** Berg (p. 595)
   Margin of jugum thick, calloused, ecarinate or with partial carina (not reaching eyes) located submarginally . . . **Ecarinoceps,** new subgenus (p. 583)

***Dallasiellus (Pseudopangaeus)*, new subgenus**

Diagnosis.—The members of this subgenus differs from all other species in *Dallasiellus* by the combination of strong crenulations and evaporatorial interruption mentioned in the key and illustrated by figure 106. The males can be more readily separated by the presence of a strong angulation ventrally on the posterior tibia (fig. 148).

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[9] The *Cydnus insularis* which Westwood (1837, p. 19) described from "Insula Sti. Vincentii" apparently also belongs to this genus. Dr. Graham's notes on the type in the collection at Oxford University show it to lack a terminal modification of the peritreme and to have an incomplete row of setigerous punctures on the submargin of the jugum. These features coupled with the small size will permit no other assignment. But as yet, not enough information is at hand to place it exactly. It most probably belongs in either the subgenus *Ecarinoceps* or the subgenus *Dallasiellus*. If the former, it will run to couplet 5 in the key to species but will differ from both forms found there in possessing a partial row of setigerous punctures on the submargin of the jugum. If it belongs to *Dallasiellus* it will probably run to *lugubris* in couplet 14 of the key to species.

Description.—Agreeing with the generic description except in the following important modifications:

Head: Juga dorsally always with entire, fine, marginal carina, with partial row of setigerous punctures reaching about two-thirds from eye to apex; labium reaching between middle coxae.

Mesopleuron: Evaporatorium restricted (fig. 106), reaching not more than three-fourths across segment, separated from posterior margin on outer half or more by a polished band; posterior margin with large, quadrate, widely separated crenulations (fig. 106).

Legs: Posterior tibia of male moderately curved, with distinct, subbasal angulation on posteroventral margin, basad of which is a row of fine, rounded, crenulations (fig. 148); posterior and sometimes middle femora with numerous small tubercles on ventral face.

Type of subgenus.—*Pangaeus discrepans* Uhler (1877, p. 386), here designated.

Distribution.—This subgenus occupies the northernmost segment of the range of *Dallasiellus*, being known generally from the territory west of the Rocky Mountains from Washington south into northern Mexico and eastward through New Mexico into western Texas and Oklahoma.

Discussion.—The transfer of Uhler's species *discrepans* from *Pangaeus* to its present position removes one of the enigmas in North American hemipterology. At the same time, the nearness of this subgenus to *Pangaeus* through *discrepans* is recognized. As was noted in the discussion of *Dallasiellus*, this genus serves as a vehicle for the least strongly modified species of Western Hemisphere Cydnidae. Since such is the case, one should not be surprised to find that some of the included species do resemble certain of the more strongly marked genera, even though they lack the unique separating modifications of those genera. The present subgenus, *Pseudopangaeus*, resembles *Homaloporus*, the northern subgenus of *Pangaeus*, in several interesting respects. First, it is somewhat northern in distribution, occurring mostly within the United States. Secondly, there are the following structural parallels: (1) Several setigerous punctures on jugal submargins; (2) usually (except in *D. californicus*) with four or more costal setigerous punctures; (3) the mesopleural evaporatorium is restricted; (4) osteolar peritreme lacks a terminal differentiation, and its evaporatorium has lateral margin strongly concave. The modification of the hind legs (ventral tubercles on femora of both sexes, and the subbasal angulation on the tibia of the male), which forms such a prominent character here, is duplicated in the subgenus *Homaloporus* in *Pangaeus setosus*, new species, and *Pangaeus tuberculipes*, new species. These several similarities suggest the possibility that the species of subgenus *Pseudopangaeus* actually belong

with those of *Pangaeus*. Perhaps they do; perhaps they represent the still unmodified "ancestral stock" from which more specialized *Pangaeus* arose; or perhaps they are an offshoot from *Pangaeus*. Regardless of the reason for the admitted closeness of *Pangaeus*, the addition of these species to that genus would create a major problem of defining and separating the genera in Group B of the subfamily Cydnidae. As here treated, the species groups, whether at a generic level or a higher or lower level, can be recognized in a usable way—surely one of the principal aims of systematics is to produce an arrangement that is workable as well as "natural." The present author, therefore, chooses to recognize the sharply impressed, subapical line on the pronotum as being sufficiently diagnostic to separate *Pangaeus* from *Dallasiellus* in a practical way (but even this character is suggested by partial and vague lines or a sunken row of punctures in some individual specimens of subgenus *Pseudopangaeus*).

Key to species of *Dallasiellus* (*Pseudopangaeus*), new subgenus

1. Corium distinctly alutaceous; peritreme abruptly terminated apically (as in fig. 107) . . . . **californicus** (Blatchley) (p. 575)
   Corium polished; apex of peritreme fusing gradually into surrounding cuticula (fig. 106) 2
2. Scutellum distinctly longer than wide; size smaller, length of body 6.7–8.2 . . 3
   Scutellum as wide as or wider than long; size larger, length of body 8.6–10.0. **vanduzeei,** new species (p. 582)
3. Pronotum laterally with abundant, close-set, intermixed coarse and fine punctures; mesocorium with many distinct punctures throughout and forming two complete rows paralleling claval suture. **puncticoria,** new species (p. 580)
   Pronotum laterally with no fine punctures between the few, well-separated, coarse punctures; mesocorium with one complete and the basal part of a second row of punctures paralleling claval suture, discally impunctate or with few punctures near apex . . . . **discrepans** (Uhler) (p. 577)

***Dallasiellus* (*Pseudopangaeus*) *californicus* (Blatchley), new combination**

Plate figure 260

Pangaeus californicus Blatchley, 1929, p. 74.—Torre Bueno, 1939, p. 180.

Diagnosis.—The finely but distinctly alutaceous surface of the corium sets this species apart from the others in the subgenus.

Description.—Male: Elongate-oval, widest immediately anterior to base of pronotum.

Head: Length two-thirds width, 1.46(1.38–1.56):2.13(1.97–2.34); interocular width, 1.30(1.17–1.44); anterior margin approximately semicircular; juga a little longer than clypeus and contiguous beyond it; jugal surface moderately rugose on apical half, minutely punctured anterior to ocelli, with three or four widely separated, submarginal setigerous punctures; juga ventrally polished; maxillary plate aluta-

ceous, with few weak punctures toward base. Antennal segments: I, 0.46(0.43–0.50); II, 0.68(0.66–0.71); III, 0.62(0.59–0.68); IV, 0.94(0.90–1.00); V, 1.00(0.94–1.05). Bucculae about as high as labial II. Labial segments: I, 0.71(0.70–0.73); II, 1.25(1.16–1.35); III, 1.11(1.03–1.20); IV, 0.61(0.60–0.63).

Pronotum: Length more than half width, 2.75(2.40–3.00):5.08 (4.61–5.53); anterior margin broadly and rather shallowly emarginate; side margins entire, narrowing from base or from immediately anterior to base, with submarginal row of seven or eight setigerous punctures; transverse impression obsolete to absent, submedian, marked by a broad band of moderate punctures; remainder of surface virtually impunctate except for several punctures on middle of posterior lobe.

Scutellum: Longer than wide, 3.39(3.02–3.70):3.13(2.83–3.60); surface shining, or faintly alutaceous, with several irregularly scattered punctures discally.

Hemelytron: Corium and clavus alutaceous; former with distinct punctures restricted to a single complete row paralleling claval suture and basal third of a second row; clavus with a single longitudinal row of punctures becoming evanescent posteriorly; costa with none to three setigerous punctures; membranal suture faintly sinuate near lateral angle, latter slightly acute.

Propleuron: Depression with numerous coarse, close-set punctures ventrally; prosternal carinae low, blunt.

Mesopleuron: As described for genus.

Metapleuron: Peritreme abruptly terminated apically (as in figure 107); evaporatorium with lateral edge slightly concave; lateral shining area tumid, impunctate or with a few moderate punctures.

Sternites: Impunctate, alutaceous; sutures finely crenulate.

Legs: Long; posterior tibia gently curved, with prominent angulation at basal fourth of posteroventral margin, emargination basad of this finely crenulate.

Terminalia: Genital capsule with apical margin slightly emarginate medially, surface punctured along base and apex; gonostylus as illustrated (fig. 260).

Length of body: 9.62(8.58–10.46).

Female: Similar to males except for generally fewer pronotal punctures and the absence of the tibial modification described above.

Head: Length-width ratio, 1.45(1.43–1.49):2.08(2.02–2.17); interocular width, 1.25(1.22–1.31). Antennal segments: I, 0.50(0.47–0.56); II, 0.68(0.64–0.76); III, 0.63(0.60–0.68); IV, 0.91(0.86–1.00); V, 0.97(0.93–1.03). Labial segments: I, 0.78(0.71–0.90); II, 1.30 (1.30–1.33); III, 1.06(0.98–1.13); IV, 0.64(0.61–0.70).

Pronotum: Length-width ratio, 2.78(2.68–3.00):5.03(4.79–5.42).

Scutellum: Length-width ratio, 3.41(3.17–3.88):3.00(2.74–3.45).

Length of body: 9.40(8.78–10.21).

TYPE DATA.—The type female, now in the W. S. Blatchley collection (Ind), was listed as coming from "near Sunland, Los Angeles County, California."

SPECIMENS STUDIED.—20 males, 38 females.

UNITED STATES: *Arizona:* Antelope Park (Yavapai Co.), Chiricahua Mts., Continental, Devoe, Globe, Hackberry, Hualpai Mt., Kit's Peak (4,050 feet, Baboquivari Mts.), Sabino Basin (Santa Catalina Mts.), Rita Mts., Thatcher, Tucson; May to September. *California:* Cold Water Canyon (Los Angeles Co.), Pamona, Piñon Flat (San Jacinto Mts.), Sequoia National Park (Ash Mountain Road, Potwisha, Wolverton), Van Nuys, "So. California"; March to October. *New Mexico:* Las Cruces, Mesilla Park, Rodeo; March, June, July. *Texas:* Boquillas, Terlingua; May, July.

MEXICO: *Baja California*: Ensenada.

DISCUSSION.—In describing this species as new, Blatchley pointed out its nearness to Uhler's "*Pangaeus discrepans*" and suggested that these two forms differed from other true *Pangaeus* in lacking the subapical impressed line on the pronotum.

Ecological data consisted of the lone collection note given with the original description, "from beneath a stone in a small semi-desert area."

Dallasiellus (*Pseudopangaeus*) *discrepans* (Uhler), new combination

PLATE FIGURES 106, 148, 261

Pangaeus discrepans Uhler, 1877, p. 386; 1886, p. 3.—Distant, 1880, pl. 2, fig. 19.—Signoret, 1882, p. 249, pl. 8, fig. 109.—Lethierry and Severin, 1893, p. 69.—Banks, 1910, p. 100.—Van Duzee, 1917, p. 21.—Torre Bueno, 1939, p. 180.

DIAGNOSIS.—This species may be separated from its related species by the elongate scutellum and the polished mesocorium, which is virtually impunctate on the apical half or more, coupled with the smaller size, 6.8–8.2.

DESCRIPTION.—MALE: Oval, widest behind the middle.

Head: Length about two-thirds width, 1.23(1.24–1.26):1.83(1.71–1.91); interocular width, 1.22(1.16–1.26); anterior margin a broad semicircle, sometimes slightly truncated apically; juga as long as clypeus or slightly longer and nearly or quite meeting anterior to it; surface with several radiating, moderate rugae and numerous minute punctures; ocelli very small, separated from eye by a space equalling about four times transverse ocellar diameter; jugum ventrally polished, impunctate; maxillary plate faintly alutaceous, with few or no punctures. Antennal segments: I, 0.41(0.40–0.43); II, 0.49(0.46–0.53); III, 0.47(0.43–0.50); IV, 0.64(0.60–0.70); V, 0.65 (0.60–0.70). Bucculae about as high as labial II. Labial segments: I, 0.64(0.60–0.70); II, 1.00(0.96–1.06); III, 0.84(0.76–0.90); IV, 0.51(0.57–0.54).

Pronotum: Length more than half width, 2.13(1.89–2.28):3.92 (3.57–4.16); anterior margin deeply and simply emarginate; side margins entire, narrowing from just in front of base, with submarginal row of 14 to 17 setigerous punctures; transverse impression obsolete to absent, marked by a very irregular band of moderate punctures; anterior lobe with anterior submargin sometimes vaguely impressed, with a row of irregularly spaced punctures, laterally with numerous close-set punctures; posterior lobe impunctate except for a few punctures in middle and several in antero-lateral angles.

Scutellum: Longer than wide, 2.65(2.37–2.79):2.28(2.08–2.47); disc polished, with few, mostly wide scattered, sunken punctures becoming finer toward apex.

Hemelytron: Corium and clavus polished; corium usually with one complete and the basal part of a second row of punctures paralleling claval suture, exocorium punctate for most of its length; mesocorium variously punctured at base and apex and with one complete row and the basal half of a second row of punctures present and paralleling claval suture; clavus with a single, longitudinal row of punctures extending more than half way to apex; costa with five to eight setigerous punctures; membranal suture straight, lateral angle almost rectangular; membrane reaching or very slightly surpassing apex of abdomen.

Propleuron: Impunctate; prosternal carinae low, acute.

Mesopleuron and metapleuron: As described for subgenus; apex of peritreme fusing with surrounding cuticula; lateral edge of evaporatorium deeply concave (fig. 106); lateral polished area slightly convex, with several weak, longitudinal rugae.

Sternites: Polished, roughened laterally by numerous fine, longitudinal rugae; sutures finely crenulate.

Legs: Moderately long, posterior pair modified as in subgeneric description (fig. 148).

Terminalia: Genital capsule with distinct, shallow emargination at middle of apical margin; surface with numerous punctures either side of polished midline; gonostylus as illustrated (fig. 261).

Length of body: 7.57(6.83–7.94).

Female: Similar to male, usually with fewer pronotal and scutellar punctures and never with modification of posterior legs that occurs in males.

Head: Length-width ratio, 1.30(1.26–1.39):1.84(1.76–1.99); interocular width, 1.19(1.15–1.26). Antennal segments: I, 0.39(0.37–0.43); II, 0.49(0.46–0.56); III, 0.48(0.43–0.56); IV, 0.60(0.46–0.68); V, 0.65(0.54–0.71). Labial segments: I, 0.66(0.62–0.70); II, 1.05 (0.96–1.16); III, 0.89(0.76–1.03); IV, 0.54(0.50–0.60).

Pronotum: Length-width ratio, 2.11(1.95–2.28):3.97(3.78–4.36).

Scutellum: Length-width ratio, 2.70(2.53–2.86):2.44(2.34–2.60).

Length of body: 7.70(7.37–8.25).

Type data.—The types (USNM) were collected "near Fort Cobb, Indian Territory, by Dr. George H. Horn, and near San Diego, Cal., by William Holden."

Specimens studied.—37 males, 41 females.

United States: *Arizona:* Buckeye, Douglas, Flagstaff, Grand Canyon (south rim, Roaring Springs), Huachuca Mts., Oracle, Palmerlee, Pepper Sauce Canyon (Santa Catalina Mts.), Pinal Mts. (base), Ramah, Roosevelt Lake, San Carlos Lake; March to August. *California:* Claremont, Laguna Beach, Los Angeles Co., Mohave, San Diego, Santa Paula; May to July. *Colorado:* Boulder, Fort Collins; April. *Idaho:* Coeur d'Alene Lake, Lewiston; May, July. *New Mexico:* Jemez; April, June, August. *Oklahoma:* Kenton; July. *Oregon:* The Dalles, Malheur Co., Monroe, Ochocho Dam; June, September. *Pennsylvania:* Philadelphia; May (see discussion concerning this specimen). *Texas:* No exact locality. *Utah:* Salt Lake City; July. *Washington:* Asotin, Pullman, Walla Walla, Wawawai; May to October.

Discussion.—The original combination of names of this species has been the most abused of all the names in the family in the Western Hemisphere. It has been found affixed to no less than five species in three genera. What has been the real cause of this confusion is not apparent. True, Uhler's assigning it to *Pangaeus* was misleading, but the original description is complete enough to preclude many of the assignments that have been made. It is hoped that the present treatment will correct and simplify the determination of specimens of this species.

The relation of this species to *Dallasiellus puncticoria*, new species, is not yet clear to the author. *D. puncticoria*, new species, appears to share the southern half of California with *discrepans* and then range southward into Baja California. Unfortunately, the latter territory is represented by a single pair of rather atypical specimens which are somewhat suggestive of *discrepans* in having fewer mesocorial punctures than do most specimens of *puncticoria* from California proper. A goodly series of *puncticoria*, some 54 specimens, was at hand from Sequoia National Park, Calif.; this series, with one or two exceptions, was easily separated from *discrepans* by abundant mesocorial punctures. The few exceptions were quite similar to the two from Baja California and suggested that these forms belonged together. Perhaps when more intensive collecting is done with this problem in mind, *puncticoria* will be found to be but a localized variant of *discrepans* and so deserve no more than subspecific status. Unfortunately, the internal male genitalia of these two species and *vanduzeei* are all very similar and offer no help in the problem—unless one wishes to accept them as evidence that the present treatment is simply an unnecessary splitting of what is but one species.

A single female labeled "Phila., Pa., 30 May, 20, J. C. Lutz" is in the Lutz collection. This locality of capture is far removed from the continuous range of *discrepans* as indicated in the distributional data given above. In reply to a query concerning this specimen, Mr. Lutz wrote that, according to his field notes, "This specimen was found in its normal habitat, under a log in Morris Park, Phila." With doubt about the authenticity of this capture removed, one is at a loss to explain its appearance at such a distance from its native haunts. The most likely explanation that occurred to the author was that it had been carried into that area in soil around plant roots, possibly nursery stock. Additional collecting in that area might determine whether or not the species has become established.

Dallasiellus (Pseudopangaeus) puncticoria, new species

Plate figure 262

Diagnosis.—The presence of numerous distinct punctures occurring uniformly over the mesocorium will separate this species from all others in the subgenus.

Description.—Male: Oval, widest behind the middle.

Head: Length about two-thirds width, 1.17(1.16-1.20):1.71(1.63–1.86); interocular width, 1.18(1.13–1.26); anterior margin broadly semicircular, slightly flattened apically; juga slightly longer than clypeus, convergent and contiguous beyond latter; surface with several radiating, moderate rugae and numerous minute punctures; ocelli minute, separated from eye by a space equalling about five times a transverse ocellar width; jugum ventrally polished, impunctate; maxillary plate impunctate except along basal margin. Antennal segments: I, 0.35(0.34–0.37); II, 0.45(0.45–0.47); III, 0.42(0.40–0.44); IV, 0.59(0.56–0.62); V, 0.62(0.61–0.63). Bucculae about as high as labial II. Labial segments: I, 0.58(0.57–0.60); II, 0.87(0.83–0.90); III, 0.74(0.70–0.79); IV, 0.46(0.44–0.47).

Pronotum: Length little more than half width, 1.92(1.86–2.02):3.76(3.64–3.84); anterior margin deeply, simply concave; side margins entire, narrowing from just in front of base, submarginal row of thirteen to seventeen setigerous punctures; transverse impression obsolete to absent, marked by irregular band of punctures; latter very sparse at middle and close-set laterally; anterior lobe and anterior part of posterior lobe densely punctate laterally, denser punctures usually with numerous minute punctures between.

Scutellum: Longer than wide, 2.60(2.49–2.66):2.28(2.21–2.34); disc polished, usually with numerous crowded moderate punctures and minute ones in between.

Hemelytron: Corium and clavus polished; exocorium and mesocorium with numerous punctures distributed for full length, meso-

corium with two complete rows of punctures paralleling claval suture; clavus with several smaller punctures in addition to usual longitudinal row; costa with four to seven setigerous punctures; membranal suture virtually straight; membrane reaching or slightly surpassing apex of abdomen.

Propleuron: Alutaceous; punctate ventrally; prosternal carinae low, acute.

Mesopleuron: As described for subgenus.

Metapleuron: As in *D. discrepans* (fig.106), apex of peritreme fusing with surrounding cuticula; lateral edge of evaporatorium deeply concave; lateral polished area weakly convex, with few punctures.

Sternites: Shining, very weakly alutaceous, with numerous scattered, very fine punctures; sutures finely crenulate.

Legs: Moderately long, posterior pair modified as in subgeneric description (as in fig. 148).

Terminalia: Apical margin of genital capsule faintly emarginate medially, midline with few fine punctures, laterally with crowded prominent punctures; gonostylus as illustrated (fig. 262).

Length of body: 7.12(6.78–7.34).

Female: Similar to male, lacking modification of posterior legs.

Head: Length-width ratio, 1.16(1.06–1.23):1.65(1.60–1.74); interocular width, 1.16(1.12–1.23). Antennal segments: I, 0.36(0.33–0.40); II, 0.44(0.38–0.51); III, 0.42(0.40–0.46); IV, 0.56(0.53–0.60); V, 0.45(0.43–0.48). Labial segments: I, 0.55(0.53–0.60); II, 0.88(0.86–0.94); III, 0.70(0.68–0.72); IV, 0.45(0.43–0.48).

Pronotum: Length-width ratio, 1.92(1.73–2.08):3.60(3.45–3.80).

Scutellum: Length-width ratio, 2.52(2.35–2.69):2.16(2.08–2.28).

Length of body: 6.83(6.57–7.19).

Type data.—Holotype male and allotype female (both CalAc) labeled "Potwisha, Sequoia Natl. Park, Calif., 3,000–5,000 ft., V–8–31, E. C. Van Dyke collector." Paratypes, 19 males, 43 females:

California: *Sequoia National Park:* Potwisha, same data as types, 3 males, 5 females (CalAc, RCF); same collector, 2,000–5,000 feet, May 20, 1930, 3 males, 4 females, May 24, 1929, 1 female, June 2, 1929, 2 males, June 13, 1929, 3 females, June 20, 1929, 2 males (all in CalAc); July 16, 1931, 11 females. Paradise Valley, 3,000–4,000 feet, Van Dyke, 4 females (CalAc). Wolverton, 7,000–9,000 feet, Van Dyke, 2 females. No exact locality, 2,000–3,000 feet, Apr. 24, 1946, R. C. Bechter, 1 male, 1 female (McC); May 24–26, 1929, 1 male, 4 females (RLU); May 19, 1930, 1 male (RLU); 3,000–7,000 feet, May 27, 1929, 2 females (CIS); 2,000–3,000 feet, June 13, 1929, 1 female (CIS). *Los Angeles County:* Altadena, Mar. 11, 1912, J. C. Bridwell, 2 males (USNM). Playa del Roy, May 20, 1938, A. T. McClay, 1 female (McC). Claremont, August 28, 1 male (RLU). *No exact locality:* "So. Calif.," 3 males, 2 females (RLU).

Mexico: *Baja California:* Hamilton Ranch, Aug. 2, 1938, Michelbacher and Ross, 2 females (CalAc).

Discussion.—Although treated as a valid new species here, this form may prove, with more specimens from the southern half of California, to merge into *discrepans*. If this happens it will have to fall into synonymy, but for the present it is probably better to have the differences between the two brought forcibly to the attention of collectors who can solve the problem in the field or possibly by breeding the two forms.

Dallasiellus (*Pseudopangaeus*) *vanduzeei*, new species

Plate Figure 263

Diagnosis.—The large size and polished corium permits ready recognition of this species within the subgenus, as does the broad scutellum which is as wide as or wider than long.

Description.—Male: Oval, widest behind the middle.

Head: Length about three-fourths width, 1.55(1.53–1.56): 2.15(2.10–2.20); interocular width, 1.44(1.43-1.47); anterior margin a broad, slightly flattened semicircle; juga as long as clypeus, strongly narrowing latter at apex; jugal surface with strong, radiating rugae and numerous minute punctures; jugum ventrally and maxillary plate impunctate. Antennal segments: I, 0.49(0.46–0.53); II, 0.63(0.62–0.64); III, 0.62(0.61–0.63); IV, 0.81(0.80–0.84); V, 0.78(0.76–0.80). Bucculae about as high as labial II. Labial segments: I, 0.75(0.73–0.78); II, 1.32(1.30-1.37); III, 1.16(1.13–1.23); IV, 0.68(0.67–0.70).

Pronotum: Length more than half width, 2.89(2.84–3.02):5.22(4.97–5.40); anterior margin rather deeply and simply emarginate; side margins entire, narrowing from just anterior to base, with submarginal row of fourteen setigerous punctures; transverse impression obsolete to absent, marked by an irregular band of widely separated punctures; remainder of surface virtually impunctate except for numerous close-set punctures laterally on anterior lobe.

Scutellum: Wider than long, 3.42(3.27–3.60):3.31(3.15–3.45); surface polished, discally with several coarse, often sunken punctures, irregularly spaced.

Hemelytron: Corium and clavus polished; former usually with distinct punctures restricted to one complete and the basal part of a second row paralleling claval suture, some specimens with several distinct punctures at apex of exocorium; clavus impunctate or with few punctures near base; costa with five to seven setigerous punctures; membranal suture nearly straight, lateral angle slightly acute; membrane slightly surpassing apex of abdomen.

Propleuron: Depression punctate ventrally; prosternal carinae very low, acute.

Mesopleuron: As described for genus.

Metapleuron: As in *discrepans* (fig. 106), peritreme apically fusing with surrounding cuticula; lateral edge of evaporatorium deeply concave; lateral polished area faintly convex, with several obsolete, longitudinal rugae.

Sternites: Polished, impunctate; suture finely crenulate.

Legs: Moderately long; posterior tibia gently curved, with prominent angulation at basal fourth of posteroventral margin, emargination basad of this finely crenulate.

Terminalia: Genital capsule with apical margin slightly emarginate medially; surface with numerous punctures laterally, gonostylus as illustrated (fig. 263).

Length of body: 9.30(8.69)-9.95).

Female: Similar to male, usually with fewer pronotal punctures and never with the modification of the posterior tibia that occurs in the males of all species in this subgenus.

Head: Length-width ratio, 1.53(1.49–1.57):2.13(2.08–2.18); interocular width, 1.40(1.36–1.47). Antennal segments: I, 0.51(0.50–0.53); II, 0.62(0.60–0.66); III, 0.57(0.53–0.60); IV, 0.78(0.76–0.80); V, 0.78(0.75–0.83). Labial segments: I, 0.77(0.76–0.80); II, 1.30(1.26–1.35); III, 1.13(1.10–1.23); IV, 0.69(0.68–0.70).

Pronotum: Length-width ratio, 2.84(2.80–2.89):5.12(5.10–5.20).

Scutellum: Width-length ratio, 3.33(3.28–3.45):3.30(3.18–3.43).

Length of body: 9.25(8.89–9.45).

Type data.—Holotype male (USNM 64415) from Austin, Tex., with the label "*Pangaeus discrepans*" and Van Duzee's label reading "does not agree." Allotype female (USNM), "Austin, Tex., C. T. Brues." Paratypes, 5 males, 6 females:

Texas: Austin, same data as allotype, 1 male, 1 female (RCF); Mar. 2, 1900, A. L. Melander, labeled *Pangaeus ? margo*, 1 male (HMH); Nov. 23, 1900, 1 male (USNM); labeled *Pangaeus discrepans* Uhl. ?, 1 male (USNM); Mar. 25, 1900, P. R. Uhler collection, 1 female (USNM); with label "Det. by D. Stone[r?]," 1 female (USNM); Mar. 11, 1945, M. Polhemus, 2 females (HMH). Buenc, Van Duzee collection, 1 male (CalAc).

California: El Centro, July 8, 1927, G. Linsley, 1 female (RLU).

Discussion.—In general appearance, members of this species appear to be simply large-sized individuals of *discrepans*, but can be separated readily therefrom by the broader scutellum.

Dallasiellus (*Ecarinoceps*), new subgenus

Diagnosis.—The lack of a fine, marginal carina dorsally on the juga enables one to recognize species of this subgenus from those in the other two subgenera.

Description.—Agreeing with the generic description except for the following modifications:

Head: Juga dorsally without fine carina marginally, margin thickened, usually calloused, sometimes with a submarginal line; in all species (except *foratus* and *megalocephalus*) with one submarginal setigerous puncture; labial length variable from between middle of mesosternum to sternite IV.

Mesopleuron: Evaporatorium extensive, extending along posterior margin of segment into posterolateral angle; posterior margin with crenulations finer and closer set than in subgenus *Pseudopangaeus* (fig. 106).

Legs: Posterior tibia of both sexes simple; femora not tuberculate ventrally.

Type of genus.—*Aethus americanus* Stål (1860, p. 12), here designated.

Distribution.—Specimens at hand indicate the range of this subgenus as extending from Mexico south through Central America into northern Brazil and eastward into the West Indies, with a single specimen labeled from Florida.

Discussion.—The form of the jugal margin seen in the members of this subgenus appears to be almost unique within the American forms of the subfamily Cydninae appearing only in certain *Melanaethus.* In most species the juga have a fine but distinct dorsal carina at the very margin of the head. In the subgenus *Ecarinoceps*, however, such a carina is either lacking or distinctly submarginal and incomplete when the head is viewed at right angles to its dorsal surface. This feature is easily interpreted in all included species.

Key to species of subgenus *Dallasiellus* (*Ecarinoceps*)

1. Mesopleural evaporatorium reaching to lateral margin of segment 2
   Mesopleural evaporatorium approaching but not attaining lateral margin of segment (fig. 105) 6
2. Labium very long, reaching to sternite IV; anterior convexity of propleuron with numerous, close-set, moderate punctures.
   longirostris, new species (p. 591)
   Labium shorter, not surpassing middle coxae; anterior convexity of propleuron most impunctate 3
3. Costa with one setigerous puncture 4
   Costa with two setigerous punctures 5
4. Head across eyes more than half pronotal width, anterior outline broadly rounded or semicircular (fig. 62) . . **megalocephalus,** new species (p. 592)
   Head across eyes less than half pronotal width. . **laevis,** new species (p. 589)
5. Bucculae higher than labial II, terminated abruptly posteriorly (as in fig. 23); size larger, length of body, 8.2–8.8. . . . . **reflexus,** new species (p. 594)
   Bucculae lower than labial II, evanescent posteriorly; smaller, length of body, 6.0–6.7. **scitus** (Walker) (p. 587)

6. Jugum with one submarginal setigerous puncture immediately anterior to eye; mesocorium in great part impunctate. . . . . **americanus** (Stål) (p. 585)
   Jugum with three submarginal setigerous punctures; mesocorium with abundant punctation over all of surface . . . **foratus** (Signoret) (p. 587)

Dallasiellus (Ecarinoceps) americanus (Stål), new combination

Plate figures 78, 105, 264

Aethus americanus Stål, 1860, p. 12.—Walker, 1867, p. 152.
Macroscytus americanus Stål, 1876, p. 19.
Geotomus americanus Signoret, 1883, p. 34, pl. 2, fig. 143.—Lethierry and Severin, 1893, p. 72.

Diagnosis.—The peculiar shape of the mesopleural evaporatorium which extends into the posterolateral angle of the segment but does not reach all the way to the side margin (fig. 105) coupled with presence of a single submarginal setigerous puncture on the jugum will identify this species within the subgenus.

Description.—From two incomplete males and two females.

Male: Elongate-oval.

Head: Length two-thirds width, 1.01(1.00–1.03):1.56(1.56–1.56); interocular width, 0.86(0.86–0.87); anterior outline semicircular, clypeus as long as juga, slightly narrowed apically; surface slightly convex, impunctate, with one submarginal setigerous puncture in front of eye; ocelli small, on line connecting hind margins of eyes, removed from eyes by about one transverse ocellar width; jugum ventrally and maxillary plate (except at base) polished, impunctate. Antennal segments missing except I–III on one specimen: I, 0.33; II, 0.43; III, 0.46. Bucculae about as high as labial II, decurved posteriorly; labium reaching between middle coxae. Labial segments: I, 0.51(0.50–0.53); II, 0.88(0.83–0.93); III, 0.68(0.66–0.71); IV, 0.51(0.51–0.51).

Pronotum: Length about half width, 1.71(1.70–1.71):3.52(3.52–3.53); anterior margin concave; side margins concave opposite ends of obsolete, median, transverse impression due to a peculiar "fold" in margin (fig. 78); virtually impunctate except for rows paralleling anterior margin and marking site of transverse impression and a patch laterally on the anterior lobe.

Scutellum: Longer than broad, 2.50(2.47–2.53):2.07(2.02–2.12); disc shining, with a few small punctures scattered on basal half.

Hemelytron: Corium and clavus finely and almost imperceptibly (X–30) alutaceous, impunctate except for one complete and one partial row paralleling claval suture and one longitudinal row on clavus; costa with one or two setigerous punctures; membranal suture weakly bisinuate, lateral angle prolonged, acute; membrane subquadrate, reaching to apex of abdomen.

Propleuron: Polished, with distinct punctures only in depression; prosternal carinae low, narrow.

Mesopleuron: Evaporatorium large, lateral margin gently convex; polished area impunctate.

Sternites: Shining, impunctate.

Legs: Moderately long.

Terminalia: Apical margin of genital capsule slightly sinuate, not flared, surface impunctate; gonostylus as illustrated (fig. 264).

Length of body: 7.20(6.90–7.20).

Female: Similar to male but without "fold" in side margin of pronotum and scutellum with more numerous punctures extending onto apical half.

Head: Length-width ratio, 1.13(1.10–1.16):1.69(1.69–1.70); interocular width, 0.95(0.93–0.98). Antennal segments: I, 0.38(0.36–0.40); II, 0.44(0.43–0.46); III, 0.49(0.46–0.53); IV, 0.64(0.63–0.65); V, 0.80(0.80–0.80). Labial segments: I, 0.60(0.60–0.60); II, 1.03 (1.03–1.03); III, 0.74(0.73–0.76); IV, 0.58(0.56–0.60).

Pronotum: Length-width ratio, 1.88(1.82–1.95):3.64(3.63–3.66).

Scutellum: Length-width ratio, 2.76(2.66–2.86):2.23(2.13–2.28).

Length of body: 7.11(7.02–7.20).

Type data.—The type male (Stock) is labeled "Rio," and was reported by Stål to have come from Rio de Janeiro, Brazil.

Specimens studied.—2 males, 2 females.

Brazil: *Santa Catarina:* Corupa, October 1945, A. Maller, 1 female (AmM). Nova Teutonia, Oct. 6, 1944, Maller, 1 female (JCL); Feb. 22, 1949, Maller, 1 male (JCL). *Rio de Janeiro:* "Rio," type specimen, 1 male (Stock).

Discussion.—The type specimen was available for study through the kindness of Dr. Rene Malaise. It proved to be in an excellent state of preservation, lacking only antennals II–V on one side and IV and V on the other.

The peculiar "fold" which occurs in the side margin of male pronotum appears in only one other known species of cydnid, *Dallasiellus solitaria* (Horváth). The biological significance of this structure is not apparent and as a taxonomic character it appears to be of no more than specific worth, as *americanus* and *solitaria* are not especially closely related, other than generically, on other features.

Signoret's illustration of the pleurae of this species is so inaccurate as to suggest the possibility of an error in association of sketches. His illustration of those structures for *foratus* is reasonably similar to that of *americanus* as determined in the present paper from a study of Stål's type.

Dallasiellus (Ecarinoceps) foratus (Signoret), new combination

Geotomus foratus Signoret, 1883, p. 38, pl. 2, fig. 146.—Lethierry and Severin, 1893, p. 72.

Diagnosis.—Within the subgenus, *foratus* may be recognized by the presence of three submarginal setigerous punctures on each jugum coupled with the fact that the mesopleural evaporatorium extends into the posterolateral angle of the segment but does not attain the lateral margin.

Description.—In the absence of specimens for study, the original description is quoted:

D'un noir brun foncé, le rostre, les tarses, les antennes d'un brun jaune, le premier article de ces dernières jaune.

Tête arrondie, les lobes latéraux plus longs que les médians, se touchant presque au delà et offrant trois cils sur les bords, dont un très près des yeux et les deux autres espacés au milieu de la distance de ce dernier au lobe médian. Vertex peu ponctué. Rostre atteignant le sommet des hanches intermédiaires; le premier article entièrement enchâssé entre les carènes rostrales. Antennes avec le deuxième article plus long que le troisième. Prothorax offrant une très forte ponctuation, très brillant, avec quatre ou cinq cils sur les bords lateraux; derrière le bord antérieur une ligne transverse de forts points entre les deux points piligères sous-ocellaires, sur les côtés latéraux et sur l'impression transverse de forts points bien détachés. Écusson avex l'extrémité subarrondie; une forte ligne de points de chaque côté et le disque fortement ponctué. Élytres fortement ponctuées, excepté sur la corie, où la ponctuation est obsolète; la côte marginale est très forte jusqu'au milieu, à peine visible ensuite et offrant deux points piligères vers la base. Membrane d'un jaune hyalin, dépassant d'un quart l'abdomen: celui-ci lisse, très brillant. Plaque mésosternale arrondie en avant, faiblement striée, avec une forte ligne audessus de la suture; quelques points sur la partie lisse en dessus. Plaque métasternale presque droite sur les côtés, avec quelques stries. Canal ostiolaire finissant par un lobe arrondi subélevé, avec une dent dans l'echancrure. Dans l'espace post-métasternal une forte ligne de points limitant les hanches postérieures. A la base de chaque segment, une ligne ponctuée-crénelée.

Type data.—The type specimen (Br M) was described from "Amazones."

Specimens studied.—None.

Discussion.—In the absence of specimens for study the author tentatively diagnosed this form from the original description and illustration. Dr. China's notes on the type specimen confirmed the results.

Dallasiellus (Ecarinoceps) scitus (Walker), new combination

Plate figures 45, 265

Aethus scitus Walker, 1868, p. 535.
Aethus ? scitus Uhler, 1886, p. 3.
Aethus scitus "incerti loci" Lethierry and Severin, 1893, p. 81.

Diagnosis.—Three characters are needed to set this species apart from the others in the subgenus: Mesopleural evaporatorium reach-

ing to side margin of segment, costa with two setigerous punctures, and bucculae low and evanescent posteriorly.

Description.—Male: Oval, width greatest just anterior to midlength.

Head (fig. 45): Length less than two-thirds width, 0.96(0.90–1.05): 1.52(1.38–1.63); interocular width, 0.83(0.78–0.87); anterior outline a broad, sometimes slightly flattened semicircle; juga as long as clypeus, latter very slightly narrowed toward apex; a single, submarginal setigerous puncture next to eye; surface impunctate, with broad, shallow, longitudinal depression on juga; ocelli large, separated from eye by space less than transverse ocellar width; jugum ventrally and maxillary plate (except along bucculae) shining, impunctate. Antennal segments: I, 0.28(0.25–0.30); II, 0.43(0.40–0.49); III, 0.39(0.33–0.43); IV, 0.52(0.50–0.56); V, 0.63(0.60–0.70). Bucculae lower than labial II, evanescent posteriorly; labium attaining middle coxae. Labial segments: I, 0.44(0.38–0.50); II, 0.81(0.76–0.86); III, 0.61(0.56–0.66); IV, 0.46(0.43–0.50).

Pronotum: Length about twice width, 1.54(1.36–1.62):3.14(2.78–3.41); anterior margin shallowly concave; side margins entire, without "fold," submarginal row of six setigerous punctures; transverse impression postmedian, weak to obsolete, marked by single, medially interrupted row of punctures; remainder of surface impunctate except for row of punctures paralleling anterior emargination, a few toward sides and usually several in middle of posterior lobe.

Scutellum: Longer than wide, 2.32(2.18–2.43):1.90(1.69–2.02); surface shining, with numerous punctures on disc, impunctate at base and apex.

Hemelytron: Corium and clavus finely but distinctly alutaceous; exocorium and all of mesocorium, except two rows paralleling claval suture, impunctate; clavus with a longitudinal row of punctures and a few laterad of this basally; costa with two setigerous punctures; membranal suture faintly bisinuate, lateral angle somewhat acute; membrane distinctly longer than basal width, slightly surpassing apex of abdomen.

Propleuron: Shining, punctate in depression and anterior to base of acetabulum; prosternal carinae low, acute, truncated ventrally.

Mesopleuron: Evaporatorium reaching side margin of segment; lateral area impunctate, with few coarse rugae.

Metapleuron: Lateral margin of evaporatorium oblique, slightly concave; lateral area impunctate.

Sternites: Polished, impunctate.

Legs: Moderately long.

Terminalia: Apical margin of genital capsule with a very shallow, broad V-shaped emargination, surface impunctate except at lateral angles; gonostylus as illustrated (fig. 265).

Length of body: 6.34(5.86–6.66).

FEMALE: Very similar to male.

Head: Length-width ratio, 0.98(0.94–1.02):1.55(1.46–1.60); interocular width, 0.87(0.85–0.90). Antennal segments: I, 0.29(0.28–0.30); II, 0.44(0.40–0.48); III, 0.39(0.33–0.44); IV, 0.52(0.46–0.56); V, 0.63(0.60–0.70) Labial segments: I, 0.46(0.41–0.50); II, 0.81 (0.74–0.86); III, 0.64(0.60–0.69); IV, 0.47(0.44–0.50).

Pronotum: Length-width ratio, 1.56(1.49–1.62):3.19(3.07–3.30).

Scutellum: Length-width ratio, 2.36(2.24–2.42):1.96(1.89–2.02).

Length of body: 6.33(6.04–6.73).

TYPE DATA.—Walker's type of *Aethus scitus* (BrM) was listed as coming from "St. Domingo," an early name for the Dominican Republic.

SPECIMENS STUDIED:

BAHAMAS: South Bimini Island, June to August 17, 1951, C. and P. Vaurie, 6 males, 7 females (AmM; RCF). New Providence, Nassau, August 5, Clench, 1 male, 1 female (MCZ).

CUBA: Guantánamo, May 7, 1924, B. Hioram, 1 male (JCL).

HAITI: Port au Prince, May 1925, 1 male (USNM). Fond-Parisien, Feb. 11–18, 1922, altitude about 60 feet, 1 female (AmM). Gros-Morne, Feb. 17, 1926, E. C. Leonard, 1 female (USNM).

HISPANIOLA: "St. Domingo," 1 male (BrM), type.

DISCUSSION.—Personal study of Walker's type clearly showed that Distant (1899, p. 222) was in error when he placed *scitus* as a synonym of *Pangaeus margo*, which is made a synonym of *Pangaeus aethiops* in the present paper. One of the specimens had been labeled as "*Geocnethus cubensis* Barber and Bruner."

Dallasiellus (Ecarinoceps) laevis, new species

PLATE FIGURES 176, 266

DIAGNOSIS.—The single setigerous puncture on the costa coupled with the narrow, impunctate head and the mesopleural evaporatorium extended to the side of the segment permits recognition of this species within the subgenus. The narrow, very deep emargination at the apex of the male genital plate (fig. 176) marks that sex from the males of all other species within the genus.

DESCRIPTION.—MALE: Elongate-oval, widest across pronotum.

Head: Length about two-thirds width, 0.84(0.80–0.86):1.29(1.26–1.30); interocular width, 0.77(0.74–0.80); anterior outline almost semicircular, clypeus very slightly surpassing juga; surface gently convex, impunctate, with weak radiating rugae and one submarginal puncture in front of eye; ocelli moderate, separated from eye by space

subequal to transverse diameter of an ocellus; juga ventrally polished, impunctate; maxillary plate punctate for most of its length. Antennal segments: I, 0.29(0.28–0.30); II, 0.39(0.37–0.43); III, 0.38 (0.37–0.40); IV, 0.47(0.46–0.50); V, 0.62(0.60–0.63). Bucculae lower than labial II, evanescent posteriorly; labium reaching between middle coxae. Labial segments: I, 0.45(0.43–0.47); II, 0.86(0.83–0.91); III, 0.57(0.53–0.61); IV, 0.39(0.36–0.43).

Pronotum: Length less than half width, 1.39(1.30–1.49):2.95 (2.89–3.00); anterior margin moderately concave; lateral margins entire, distinctly narrowing from base; transverse impression postmedian, obsolete, absent medially; with several close-set, distinct punctures at ends of transverse impression and several widely separated ones scattered medially and on posterior lobe.

Scutellum: Longer than wide, 2.32(2.28–2.35):1.82(1.82–1.82); surface shining, numerous punctures scattered over disc, base and elongate apex impunctate.

Hemelytron: Corium and clavus finely but distinctly alutaceous, with usual rows of punctures, one on clavus and two on mesocorium paralleling claval suture; remainder of mesocorium impunctate; exocorium with numerous obsolete or distinct punctures scattered along most of length except apex; costa with one setigerous puncture; membranal suture almost straight, lateral angle weakly prolonged; membrane about as long as basal width, not surpassing apex of abdomen.

Propleuron: Punctate ventrally, in depression and on posterior convexity; prosternal carinae very low, fine.

Mesopleuron: Evaporatorium extended to side margins of segment; lateral area rugose, impunctate.

Metapleuron: Evaporatorium with side margin gently concave; lateral area impunctate.

Sternites: Shining, obsoletely alutaceous; with a few punctae laterally.

Legs: Moderately long.

Terminalia: Apical margin of genital capsule roundly convex either side of narrow, very deep emargination (fig. 176), punctate laterally; gonostylus as illustrated (fig. 266).

Length of body: 5.97(5.84–6.13).

Female: Similar to male except pronotal and scutellar punctae more numerous and radial vein ending in area of punctae; membrane surpassing apex of abdomen.

Head: Length-width ratio, 0.87(0.83–0.94):1.30(1.27–1.36); interocular width, 0.77(0.73–0.81). Antennal segments: I, 0.30(0.28–0.33); II, 0.40(0.38–0.43); III, 0.39(0.38–0.41); IV, 0.49(0.46–0.52);

V, 0.61(0.60–0.63). Labial segments: I, 0.44(0.43–0.46); II, 0.87 (0.80–0.93); III, 0.55(0.53–0.60); IV, 0.43(0.40–0.46).

Pronotum: Length-width ratio, 1.48(1.43–1.52):2.96(2.84–3.13).

Scutellum: Length-width ratio, 2.39(2.21–2.60):1.85(1.74–2.02).

Length of body: 5.88(5.55–6.30).

Type data.—Holotype male and allotype female (both MCZ) labeled "Constanza, Aug. '38, Dom. Rep., 3–4,000 ft., Darlington." Paratypes, 5 males, 7 females, as follows:

Dominican Republic: Constanza, same data as type, 1 male (RCF), 2 females (RCF; MCZ). Vicinity of Valle Nuevo, cloud forest, 6,000 feet, August 1928, Darlington, 2 males (USNM; MCZ), 2 females (USNM; MCZ). Foothills of Cordillera Central, south of Santiago, June 1928, 1 male, 1 female (MCZ).

Haiti: Mt. Basil, to 4,700 feet, Sept. 9, 1934, Darlington, 1 male, 2 females (MCZ).

Discussion.—The distribution of this form undoubtedly will be found to be more widespread than is indicated by the data on the type series.

Dallasiellus (*Ecarinoceps*) *longirostris*, new species

Plate figures 77, 267

Diagnosis.—The very elongate labium of which the first segment surpasses the bucculae by about one-third its own length sets this species apart from all others in the genus.

Description.—From a single male. Elongate, parallel-sided, moderately convex above, more strongly so below.

Head: Width one-fifth greater than length, 1.28:1.00; interocular width, 0.86; anterior outline semicircular, eyes strongly projecting (about two-thirds width); surface convex transversely and longitudinally, with numerous punctures except on clypeus; ocelli posterior to line connecting hind margins of eyes, separated from eye by more than transverse ocellar diameter; juga with no submarginal setigerous punctures except the one in front of the eye; clypeus very slightly longer than juga, very slightly narrowed at apex; jugum ventrally polished, impunctate; maxillary plate with several scattered, distinct punctures. Antennal segments: I, 0.36; II, 0.43; III, 0.50; IV, 0.70; V, 0.94. Bucculae about as high as labial II. Labial segments: I, very long, 0.81, surpassing base of bucculae and reaching base of prosternal carinae; II, 1.30; III, 1.00; IV, 1.10.

Pronotum: Length slightly more than half width, 1.36:2.53; anterior margin very deeply concave; side margins subparallel on basal two-thirds then more abruptly narrowed; side margin slightly sinuate at ends of submedian transverse impression; latter marked by irregular wide band of large punctures; anterior lobe with wide band of close-set punctures immediately behind anterior emargination, and a deep,

longitudinal depression laterally (fig. 77); posterior lobe irregularly punctured on anterior half.

Scutellum: Longer than wide, 2.21:1.56; surface shining, rather convex, with numerous, irregularly spaced punctures becoming finer apically.

Hemelytron: Corium and clavus polished; exocorium punctate for full length; mesocorium with two complete rows of punctures on apical third; clavus with one complete row and one incomplete row of punctures; costa without setigerous punctures; membranal suture virtually straight; membrane very slightly longer than basal width, slightly surpassing apex of abdomen.

Propleuron: Polished, punctured on both convexities and in depression; prosternal carinae convex, as high as labial II.

Mesopleuron: Evaporatorium reaching side margin of segment; lateral polished area punctate.

Metapleuron: Lateral edge of evaporatorium straight; lateral area impunctate.

Sternites: Polished, punctate laterally; sutures finely crenulate.

Legs: Moderately long.

Terminalia: Margin of genital capsule flared, surface with numerous punctures, gonostylus as illustrated (fig. 267).

Length of body: 5.92.

Type data.—Holotype male (Carv) from Manaus, Amazonas, Brazil, "Parko, 7, 1941."

Discussion.—The elongate form, long labium, and lack of submarginal setigerous punctures on the head is suggestive of Uhler's species "*Lobonotus anthracinus*," but members of this new species are easily separated therefrom by the generic character of the peritreme, and also by the very long first labial segment which here exceeds the bucculae by about one-third of its length. The broad, longitudinal impression laterally on the anterior pronotal lobe appears to be unique in the Cydnidae of the Western Hemisphere. This character, however, is probably restricted to the male.

Dallasiellus (*Ecarinoceps*) *megalocephalus*, new species

Plate figures 62, 175, 268

Diagnosis.—The very large head (fig. 62), which is broader than half the width of the pronotum, should separate this cydnid from all others in the Western Hemisphere.

Description.—Male: Oval.

Head: Length about three-fifths width, 1.54(1.49–1.56):2.52(2.37–2.60); interocular width, 1.51(1.49–1.56); anterior outline semicircular, sometimes flattened; clypeus as long as juga, strongly narrowed at apex; surface concave, vertex with a broad, shallow, U-shaped carina

between ocelli; juga with few to several prominent punctures; ocelli moderate, removed from eyes by a space twice an ocellar width; juga ventrally polished, impunctate; maxillary plate with punctate impression mesad of antennal insertion and punctate along basal margin. Antennal segments: I, 0.36(0.36–0.36); II, 0.60(0.53–0.66); III, 0.56 (0.50–0.60); IV, 0.81(0.73–0.86); V, 0.94(0.90–1.00). Bucculae lower than labial II; labium reaching between middle coxae. Labial segments: I, 0.73(0.70–0.76); II, 1.04(0.96–1.10); III, 1.21(1.16–1.23); IV, 0.76(0.73–0.80).

Pronotum: Length about half width, 2.45(2.38–2.55):4.75(4.47–4.92); anterior margin shallowly concave, about two-thirds of basal width; side margins entire, gradually narrowed from base and more abruptly at apical third, with five or six submarginal setigerous punctures; transverse impression obsolete to absent, marked by irregular, postmedian band of punctures; anterior lobe with a row of punctures paralleling anterior emargination and several punctures laterally; posterior lobe with several punctures medially.

Scutellum: Length and width equal, 3.01(2.85–3.12):3.01(2.84–3.12); surface shining, with numerous punctures except across base and apex.

Hemelytron: Corium and clavus very weakly alutaceous; exocorium abundantly punctate for full length; mesocorium with two complete rows of punctures paralleling claval suture, and numerous punctures at base and apex; clavus with several punctures in addition to longitudinal row; costa with one setigerous puncture; membranal suture weakly concave, lateral angle acute; membrane reaching apex of abdomen, slightly longer than basal width.

Propleuron: Impunctate except along anterior margin and in depression; prosternal carinae very low, thick, blunt.

Mesopleuron: Evaporatorium reaching side margin of segment; lateral shining area rugopunctate.

Metapleuron: Evaporatorium slightly concave laterally; lateral area impunctate.

Sternites: Polished, impunctate.

Terminalia: Apical margin of genital plate with deep U-shaped notch (fig. 175), surface impunctate; gonostylus as illustrated (fig. 268).

Length of body: 8.93(8.50–9.26).

Female: Based on two specimens. Similar to males, but surface of head flattened or concave only on juga.

Head: Length-width ratio, 2.32(2.10–2.55):4.63(4.23–5.00); interocular width, 1.49(1.43–1.56). Antennal segments: I, 0.35(0.35–0.36); II, 0.58 (0.53–0.63); III, 0.56(0.50–0.63); IV, 0.82(0.73–0.92); V, 0.93

(0.86–1.00). Labial segments: I, 0.68(0.63–0.73); II, 0.99(0.96–1.03); III, 1.21 (1.16–1.26); IV, 0.76(0.70–0.83).

Pronotum: Length-width ratio, 2.32(2.10–2.55):4.63(4.26–5.00).

Scutellum: Length-width ratio, 2.92(2.70–3.15):2.92(2.70–3.15).

Length of body: 8.53(7.92–9.14).

Type data.—Holotype male and allotype female (both Car), "Chapada, Brazil, Acc. No. 2966, Aug." Paratypes, 3 males, 3 females, as follows:

Brazil: Chapada, same data as types, 1 female (Car). Manaus, Amazonas, November 1941, 1 male (Carv).

Panama: *Canal Zone:* Barro Colorado Island, October–November 1941, J. Zetek, No. 4915, 1 male (USNM); April 1941, J. Zetek, No. 4985, 1 male (RCF).

British Guiana: Kartabo, June 18, 1925, C. C. Searl, 1 female (CalAc). Upper Kutari River, January-March 1936, G. A. Hudson, 1 female (BrM).

Discussion.—The extremely large head (fig. 62) marks this as being quite distinct from all other Cydnidae of the Western Hemisphere. In all the males and some of the females studied the surface of the head was distinctly concave, in the other females flattened with the juga longitudinally depressed along the middle. The punctation of the head appears to become a little more numerous and dense in the specimens from the southern part of the range, but the very broad head and the unusual, deep, U-shaped notch at the apex of the genital capsule of the male confirm that they all belong to one species. One of the Chapada females listed among the paratypes appears to be a malformed individual and so was not included in the measurements given above; the pronotum was shrunken and reduced in size, as was the apical part of the scutellum, with a consequent change in size and shape of these two parts.

Dallasiellus (Ecarinoceps) reflexus, new species

Plate figure 26

Diagnosis.—The high bucculae whose posterior termination is abrupt, not evanescent, mark this species within the subgenus.

Description.—Known from three females. Oval, widest at midlength.

Head: Length two-thirds width, 1.22(1.17–1.30):1.84(1.75–1.92); interocular width, 1.12(1.04–1.17); anterior outline a faintly flattened semicircle; clypeus as long as juga, distinctly narrowed apically; juga impunctate, with few weak, radiating rugae and but one submarginal setigerous puncture in front of eye; ocelli small, separated from eye by almost twice transverse ocellar width; jugum ventrally and maxillary plate, except at base, shining, impunctate. Antennal segments: I, 0.35(0.33–0.40); II, 0.63(0.60–0.66); III, 0.53(0.53–0.53);

IV, 0.71(0.70–0.73); V, 0.82(0.80–0.83). Bucculae higher than labial II, abruptly terminated posteriorly; labium reaching posterior half of mesosternum. Labial segments: I, 0.63(0.56–0.70); II, 1.05(0.96–1.10); III, 0.72(0.66–0.76); IV, 0.53(0.50–0.56).

Pronotum: Length more than half width, 2.36(2.21–2.44):4.29 (4.10–4.52); anterior margin moderately concave; side margins entire, gently narrowed from base, more abruptly so on apical third; transverse impression obsolete to absent; with few punctures along transverse impression, on middle of posterior lobe and sometimes behind anterior emargination, remainder of surface impunctate.

Scutellum: Longer than broad, 3.16(3.00–3.35):2.61(2.53–2.69); surface shining, punctured except at base and apex.

Hemelytron: Corium and clavus finely but distinctly alutaceous; exocorium and mesocorium mostly with very weak to obsolete fine punctures, mesocorium also with two rows of coarser punctures paralleling claval suture; clavus with one row and basal part of another row of punctures; costa broadly reflexed, with two setigerous punctures; membranal suture nearly straight, lateral angle weakly produced; membrane surpassing tip of abdomen, length longer than basal width.

Propleuron: Shining, impunctate except near acetabulum and in depression; prosternal carinae low, acute.

Mesopleuron: Evaporatorium reaching lateral margin of segment; lateral area impunctate.

Metapleuron: Lateral edge of evaporatorium weakly concave; lateral area impunctate.

Sternites: Finely alutaceous, impunctate except in spiracular area.

Legs: Moderately long.

Length of body: 8.47(8.24–8.85).

Type data.—Holotype female (USNM 64414) labeled "Colima, Volcán, Mex., L. Conrad." Paratypes, 3 females, as follows:

Mexico: Volcán de Colima, L. Conrad, 1 female (USNM).
Costa Rica: No exact locality ("la Vruca"?), No. 79, 1 female (Wien).
United States: *Florida:* Redlands, J. C. Lutz collection No. 86, 1 female (JCL).

Discussion.—The Florida paratype differs slightly from the other two specimens in having the hemelytra slightly shorter (membrane barely surpassing apex of abdomen) with the membranal suture straighter and not prolonged at lateral angle.

Subgenus *Dallasiellus* (*Dallasiellus*) Berg

Dallasiellus Berg, 1901, p. 281.

Diagnosis.—Species of this subgenus may be recognized by the presence of a complete dorsal carina on the margin of the head plus

the lack of coarse crenulations on the posterior margin of the mesopleuron and the mesopleural evaporatorium which is usually entire and reaches uninterrupted to the posterior margin of the segment.

Description.—Agreeing with the generic description with the following important modifications:

Head: Jugum with complete, fine, marginal carina dorsally, usually with two or more submarginal setigerous punctures; labial length variable from between middle coxae to base of sternite II.

Mesopleuron: Posterior margin usually with fine crenulations or none; evaporatorium extending into posterolateral angle of segment, usually attaining lateral margin.

Metapleuron: Lateral margin of evaporatorium usually straight or nearly so (deeply concave only in *fusus*); apex of peritreme not (except in *fusus*) fusing with surrounding cuticula.

Legs: Posterior tibia of both sexes without angulation near base of posteroventral margin, femora not tuberculate ventrally on apical fourth.

Type of subgenus.—Same as for type of genus.

Distribution.—From southwestern United States south through Central America and the West Indies to southern South America.

Discussion.—Comments on the definition and relationships of this taxon will be found in the generic discussion.

Several of the new species described in the present study appear to be somewhat intermediate between this subgenus and the subgenus *Dallasiellus* (*Pseudopangaeus*). Notes on these will be given at appropriate places in the text.

Key to species of subgenus *Dallasiellus* (*Dallasiellus*)

1. Dorsum of head coarsely and in large part rugosely punctate 2
   Dorsum of head not coarsely rugopunctate, either impunctate or with widely separated punctures 3
2. Bucculae abruptly terminated posteriorly (as in fig. 23); corium and sternites not distinctly alutaceous . . . . **puncticeps,** new species (p. 622)
   Bucculae evanescent posteriorly; corium and sternites distinctly alutaceous. **solitaria** (Horváth) (p. 624)
3. Peritreme abruptly terminated apically (fig. 107); lateral margin of metapleural evaporatorium straight or gently concave 4
   Apex of peritreme not abruptly terminated, fusing with surrounding cuticula (as in fig. 106); lateral margin of metapleural evaporatorium very deeply concave (as in fig. 106) . . . . **fusus,** new species (p. 604)
4. Mesopleural evaporatorium interrupted near or at posterior margin by transverse, polished band (fig. 108) 5
   Mesopleural evaporatorium not thus interrupted (fig. 107). 6

5. Corium highly polished; basal half of costa strongly depressed; male with ventral margin of anterior tibia abruptly, subquadrately expanded (fig. 128) at apex . . . . **dilatipes,** new species (p. 602)
   Corium distinctly alutaceous; costa strongly convex for full length; anterior tibia of male not expanded ventrally near apex.
   interruptus, new species (p. 608)
6. Size larger, length of body 8 mm. or more 7
   Size smaller, length of body less than 7.5 mm 10
7. Prosternal carinae as high as or higher than labial II (fig. 27).
   levipennis (Signoret) (p. 609)
   Prosternal carinae not more than half as high as labial II 8
8. Scutellum discally with numerous (35+) coarse, sunken, foveate punctures, crowded and forming coarse, transverse rugae between them.
   planicollis (Horváth) (p. 621)
   Scutellum with few widely scattered, fine punctures. 9
9. Pronotum with a single, irregular, medially interrupted line of close-set small punctures along the site of the transverse impression; posterior pronotal lobe impunctate . . . . **horvathi,** new species (p. 606)
   Pronotum with punctures coarse, along site of transverse impression forming a band that extends back onto posterior lobe . . **bergi** (Signoret) (p. 601)
10. Labium long, distinctly surpassing posterior coxae; prosternal carinae abruptly lobed (fig. 25) . . . . **longulus** (Dallas) (p. 611)
   Labium short, not reaching apices of posterior coxae; prosternal carinae not lobed 11
11. Antennal II shorter than I, about half as long as III.
   orchidiphilus, new species (p. 618)
   Antennal II longer than I, nearly or quite equal to III 12
12. Scutellum discally without large punctures; apex of mesocorium impunctate or with few punctures near radial vein 13
   Scutellum discally and usually mesocorium apically with numerous distinct, large punctures 14
13. Jugum with one submarginal setigerous puncture in front of eye.
   viduus (Stål) (p. 627)
   Jugum with four submarginal setigerous punctures in front of eye.
   triangularis, new species (p. 625)
14. Jugum with three, widely separated, setigerous punctures anterior to eye (fig. 44) 15
   Jugum with two, three, or more close-set, setigerous punctures anterior to eye, sometimes with several more widely spaced ones distally (figs. 42, 43).
   lugubris (Stål) (p. 613)
15. Corium distinctly alutaceous (at 15X) . . **alutaceus,** new species (p. 598)
   Corium shining, not distinctly alutaceous (at 30X) 16
16. Costa without setigerous punctures; pronotal transverse impression weak, marked by irregular band of small punctures.
   ovalis, new species (p. 620)
   Costa with one setigerous puncture; pronotal transverse impression distinct, obsolete medially, marked by regular row of large punctures 17
17. Larger, length of body 6.4–7.0; head with subapical, distinct, poorly defined depression (in areas indicated by dotted circle on fig. 44); clypeus elevated apically . . . . **bacchinus,** new species (p. 599)
   Smaller, length of body 4.9–5.5; head without subapical depression; clypeus not elevated apically . . . . **murinus** (Van Duzee) (p. 616)

Dallasiellus (Dallasiellus) alutaceus, new species

PLATE FIGURE 270

DIAGNOSIS.—Among the moderately large species (5.5–6.5) with the three widely separated setigerous punctures on the submargin of the head, this one may be recognized by the short labium, which does not surpass the middle coxae, and by the distinct alutaceous sculpturing of the corium.

DESCRIPTION.—MALE: Oval, slightly elongate.

Head: Length about three-fifths width 0.99(0.95–1.06):1.59(1.44–1.69); interocular width, 0.87(0.83–0.93); anterior outline less than a full semicircle, clypeus as long as juga and strongly narrowed apically; surface weakly alutaceous, with scattered fine punctures; jugum with obsolete radiating rugae, with three widely separated setigerous punctures submarginally; ocelli large, separated from eye by slightly more than transverse ocellar width; jugum ventrally and maxillary plate, except on basal fourth, polished and impunctate. Antennal segments: I, 0.32(0.30–0.33); II, 0.37(0.34–0.43); III, 0.39(0.39–0.40); IV, 0.55(0.52–0.60); V, 0.62(0.55–0.66). Bucculae about as high as labial II, evanescent posteriorly; labium reaching base of middle coxae. Labial segments: I, 0.51(0.45–0.60); II, 0.85(0.75–0.94); III, 0.60 (0.58–0.63); IV, 0.50(0.46–0.54).

Pronotum: Length slightly more than half width, 1.63(1.57–1.82): 3.16(2.93–3.43); anterior margin moderately emarginate; side margins entire, straight on basal two-thirds, with five or six setigerous punctures submarginally; transverse impression submedian, marked by regular row of close-set punctures; anterior lobe with curved row of punctures in subapical impression and numerous punctures laterally; posterior lobe with distinct punctures most numerous medially.

Scutellum: Longer than wide, 2.24(2.08–2.40):1.96(1.82–2.15); shining, with numerous crowded punctures from near base almost to apex, latter minutely punctate.

Hemelytron: Clavus and corium strongly alutaceous; clavus with one complete and one partial row of punctures; mesocorium with two complete rows of punctures paralleling claval suture, discally with distinct close punctures only at base and apex; exocorium with numerous distinct punctures for full length; costa without or with one setigerous puncture; membranal suture straight, lateral angle not prolonged; membrane longer than basal width, surpassing apex of abdomen by about one-fourth its length.

Propleuron: Feebly alutaceous, distinctly punctate in depression and anterior to acetabulum, minutely punctate on convexities; prosternal carinae less than half as high as labial II.

Mesopleuron: Evaporatorium entire; lateral area impunctate.

Metapleuron: Peritreme abruptly terminated apically; lateral margin of evaporatorium feebly concave; lateral area impunctate.

Legs: Not specially modified.

Sternites: Distinctly alutaceous, with few punctures and small rugae near spiracular area.

Terminalia: Genital capsule finely alutaceous, obsoletely punctate except for crowded punctures in lateral angles, apical margin broadly and very shallowly emarginate; gonostylus as illustrated (fig. 270).

Length of body: 5.91(5.61–6.42).

FEMALE: Very similar to male.

Head: Length-width ratio, 0.98(0.96–1.00):1.58(1.56–1.60); interocular width. 0.92(0.90–0.93). Antennal segments: I, 0.31(0.30–0.33); II, 0.36(0.36–0.40); III, 0.39(0.36–0.43); IV, 0.51(0.50–0.53); V, 0.61(0.60–0.63). Labial segments: I, 0.54(0.53–0.56); II, 0.80 (0.76–0.83); III, 0.62(0.62–0.63); IV, 0.46(0.46–0.50).

Pronotum: Length-width ratio, 1.64(1.56–1.75):3.17(3.06–3.26).

Scutellum: Length-width ratio, 2.30(2.22–2.40):1.98(1.89–2.02). Length of body: 5.76(5.57–5.92).

TYPE DATA.—Holotype male (USNM 64411) and allotype female (USNM) both labeled "Rosario Lake, Rogagua, Boliv., W. M. Mann, Oct. 28–Nov. 9, 1921. Mulford Biol. Expl., 1921–22." Paratypes, 4 males, 20 females, as follows:

BOLIVIA: Same data as types, 7 females (USNM, RCF). Chapare, July 26, 1945, 400 meters, R. Zischka, No. 163, 1 male (USNM). Rurrenabaque, Beni, W. M. Mann, October 1921, Mulford Biol. Expl., 1921–1922, 8 females, (USNM, RCF). Santa Cruz de la Sierra, 450 meters, J. Steinbach, November 1910, C. M. 4550, 2 females (Car).

BRAZIL: Viçosa, Minas Gerais, April 1945, Carvalho, 1 male (Carv). Nova Teutonia, January 1939, F. Plaumann, 1 female (JCL). Rio de Janeiro, P. Wygodzinsky, 2 males (USNM, RCF); Acc. No. 2966, 1 female (Car).

COLOMBIA: No exact locality, intercepted at Hoboken, N.J., on wild orchid, May 22, 1941, 1 female (USNM).

DISCUSSION.—The specific name refers to the distinctly alutaceous sculpturing of the corium.

Dallasiellus (Dallasiellus) bacchinus, new species

PLATE FIGURES 44, 284

DIAGNOSIS.—The weakly defined but definite subapical impression near the apex of the head (indicated by dotted outline on fig. 44) can be used to separate this species from all others in the subgenus.

DESCRIPTION.—MALE: Elongate-oval.

Head: Length about three-fourths width, 1.21(1.17–1.30):1.69(1.62–1.80); interocular width, 0.99(0.95–1.04); anterior outline rounded, juga as long or slightly longer than clypeus and almost contiguous

beyond it; jugum with three submarginal setigerous punctures; surface flattened, with weakly defined but definite subapical impression (dotted circle, fig. 44), smooth, distinctly punctured anterior to ocelli; latter well developed, separated from eye by space less than twice transverse ocellar width; jugum ventrally and maxillary plate (except posteriorly) impunctate. Antennal segments: I, 0.38(0.36–0.40); II, 0.52(0.48–0.56); III, 0.45(0.43–0.48); IV, 0.67(0.63–0.73); V, 0.79 (0.73–0.85). Bucculae about as high as labial II, labium reaching apices of middle coxae. Labial segments: I, 0.67(0.66–0.68); II, 1.04(1.00–1.10); III, 0.82(0.80–0.83); IV, 0.61(0.60–0.63).

Pronotum: Length more than half width, 1.89(1.82–1.95):3.46 (3.28–3.71); anterior margin broadly and deeply emarginate; lateral margins entire, with five or six submarginal setigerous punctures; transverse impression slightly behind middle, weakly impressed laterally, marked by irregular row of distinct punctures; anterior lobe with curved row of punctures paralleling anterior emargination and more than fifteen punctures laterally, these equal to those of transverse impression; posterior lobe with a number of punctures at middle and few laterally.

Scutellum: Little longer than broad, 2.52(2.42–2.73):2.17(2.08–2.31); surface polished, impunctate basally and apically, elsewhere with numerous, irregularly spaced coarse punctures.

Hemelytron: Corium polished, with two impressed rows of coarser punctures paralleling claval suture, mesocorium obsoletely or impunctate medially, with few moderate punctures near base and numerous finer ones near apex; exocorium distinctly punctured full length on outer half or more; costa with one setigerous puncture; clavus polished with one row of punctures extending almost to apex and a shorter row laterad; membranal suture straight, outer angle slightly acute; membrane surpassing apex of abdomen, about one-fourth longer than basal width.

Propleuron: Punctured only at anteroventral angle and in depression; prosternal carinae low, distinct, most prominent anteriorly.

Mesopleuron: Evaporatorium reaching broadly to lateral margin; lateral area impunctate.

Metapleuron: Evaporatorium separated from side margin by narrow, polished, impunctate area; peritreme attaining middle of segment, abruptly terminated.

Legs: Not specially modified.

Sternites: Shining, weakly alutaceous, rugose, with few punctures laterally.

Terminalia: Genital capsule polished, punctate laterally, apical margin very broadly, shallowly V-emarginate; gonostylus as illustrated (fig. 284).

Length of body: 6.63(6.42–7.00).

FEMALE: Very similar to male.

Head: Length-width ratio, 1.21(1.18–1.26):1.74(1.71–1.80); interocular width, 1.04(1.01–1.13). Antennal segments: I, 0.38(0.35–0.41); II, 0.52(0.50–0.55); III, 0.46(0.43–0.48); IV, 0.67(0.65–0.70); V, 0.79 (0.78–0.83). Labial segments: I, 0.65(0.63–0.70); II, 1.03(1.00–1.06); III, 0.91(0.82–0.93); IV, 0.62(0.60–0.66).

Pronotum: Length-width ratio, 1.82(1.77–1.89):3.48(3.45–3.58).

Scutellum: Longer than broad, 2.55(2.47–2.60):2.25(2.15–2.43).

Length of body: 6.56(6.42–6.71).

TYPE DATA.—Holotype male (USNM 64412) and allotype female (USNM), La Chorrera, Panama, May 10, 1912, A. Busck. Paratypes, 3 males, 3 females, as follows:

MEXICO: No exact locality, No. 1785, C. F. Baker collection, 1 male (USNM).

PANAMA: La Chorrera, same data as type, 1 female (USNM). Aquadulce. Apr. 12, 1941, 1 male, 1 female (MCZ). Ancón, Canal Zone, April 1911, Kraft, arc-light globe, 1 male, 1 female (RCF).

DISCUSSION.—The specific name alludes to the vague, cuplike impression near the apex of the head. As is often the case with Cydnidae, the only habit notes refer to specimens having been collected at a light.

Dallasiellus (*Dallasiellus*) *bergi* (Signoret), new combination

Geotomus bergi Signoret, 1883, p. 36, pl. 2, fig. 145.—Lethierry and Severin, 1893, p. 72.
Geocnethus bergi Horváth, 1919, p. 246.

DIAGNOSIS.—Among the large species of the subgenus this one may be recognized by the low prosternal carinae and the numerous coarse punctures on the pronotum.

DESCRIPTION.—Based on broken female type without antennae or legs. Oval, broadest at midlength of the hemelytra.

Head: Length-width ratio, 1.43:2.25; interocular width, 1.36; anterior outline a flattened semicircle, clypeus as long as juga; latter impunctate, with a few radiating vague rugae, submargin with three coarse, preocular setigerous punctures followed apically by a row of finer setigerous punctures; ocelli moderate, removed from eyes by a space equal to twice an ocellar width; jugum ventrally and maxillary plate impunctate; antennae missing; bucculae about as high as labial II, evanescent posteriorly; labium reaching base of abdomen. Labial segments: I, 0.86; II, 1.36; III, 1.23; IV, 0.84.

Pronotum: Length-width ratio, 2.52:4.77; anterior margin moderately deeply emarginate; lateral margin straight on basal two-thirds, distinctly curved anteriorly, submargin with six setigerous punctures; transverse impression postmedian, obsolete, with numerous,

irregularly spaced, coarse punctures; posterior lobe with some scattered coarse and fine punctures.

Scutellum: Length-width ratio, 3.45:2.66; polished, with about 15 small punctures scattered over disc; apex impunctate.

Hemelytron: Polished; clavus with three incomplete rows of punctures; mesocorium with two rows of coarse punctures paralleling claval suture and a few coarse and numerous fine punctures scattered over surface; exocorium with a few coarse punctures; costa with three setigerous punctures on the left side and two on the right; membranal suture straight, lateral angle slightly produced posteriorly; membrane little longer than basal width, slightly surpassing tip of abdomen.

Propleuron: Polished, impunctate except immediately above coxa and in depression; prosternal carinae little more than half as high as labial II.

Mesopleuron: Evaporatorium entire, reaching posterolateral angle of segment; lateral area with three punctures.

Sternites: Polished, impunctate, laterally with few horizontal, obsolete rugae.

Length of body: 9.35.

Type data. The label on the specimen in the Signoret collection (Wien) agrees with Signoret's listing from "Missiones" and so must be the type.

Specimen studied.—1 female (type), from Misiones, Argentina.

Discussion.—This species appears to be somewhat of an intermediate between *Dallasiellus* and *Tominotus* because the preocular row of submarginal setigerous punctures is almost complete, the only gap appearing between the three punctures immediately anterior to eyes and the remaining ones of the row, which are finer and set closer together.

Dallasiellus (*Dallasiellus*) *dilatipes*, new species

Plate figures 128, 149, 272

Diagnosis.—Since this species is known only from the male, separation must be made on the basis of that sex. The strong and unusual modifications of the male form the most convenient features for characterization: The peculiar quadrate lobe at the apex of the ventral margin of the anterior tibia (fig. 128); the costa strongly flattened and depressed; and the posterior femur with prominent strong knob near middle of ventral margin and spines of posteroventral row on hind tibia directed downward from prominent tubercles (fig. 149) instead of the usual oblique position from a serrated margin. Any one of these is sufficient to separate the males of this species from those of any other species within the genus.

Description.—Based on a single male. Oval, widest near midlength.

Head: Length more than half width, 1.90:2.77; interocular width, 1.67; anterior outline semicircular, clypeus as long as juga and only slightly narrowed apically; surface convex with scattered minute punctures and weak, incomplete radiating rugae; jugum submarginally with three widely separated setigerous punctures; ocelli large, separated from eye by a space subequal to transverse ocellar width; juga ventrally polished, impunctate; maxillary plate on apical half polished with a few scattered punctures; posterior half alutaceous and punctate. Antennal segments: I, 0.66; II, 0.70; III, 0.70; IV, 1.00; V, 1.00. Bucculae higher than labial II; labium reaching between posterior coxae. Labial segments: I, 1.30; II, 1.99; III, 1.82; IV, 1.31.

Pronotum: Length more than half width, 3.31:6.30; anterior margin shallowly, doubly emarginate; side margins entire, very weakly sinuate at midlength, with six or seven submarginal setigerous punctures; transverse impression obsolete, absent medially, marked by medially interrupted row of very close-set punctures; anterior lobe with curved, subapical band of intermixed minute and close-set coarse punctures; laterally similarly but with mixed sparser punctures; posterior lobe with scattered moderate and more numerous minute punctures.

Scutellum: Longer than broad, 1.79:1.67; polished, with numerous minute punctures and scattered coarser punctures discally becoming finer toward apex.

Hemelytron: Corium and clavus polished; clavus with two lateral exterior rows and one mesal row of punctures; mesocorium with two complete rows of punctures paralleling claval suture, discally with scattered fine punctures becoming crowded toward apex; exocorium for full length with numerous crowded punctures over most of surface; costa depressed, flattened, with two setigerous punctures on basal half; membranal suture nearly straight, lateral angle little produced; membrane surpassing apex of abdomen, longer than basal width.

Propleuron: Weakly punctate, rugose on anterior convexity, distinctly punctate in depression and laterally on posterior convexity, prosternal carinae very low, less than half as high as labial II.

Mesopleuron: Evaporatorium interrupted near posterior margin by polished band (as in fig. 108); lateral area roughened.

Metapleuron: Evaporatorium occupying more than three-fourths of segment, side margin straight; lateral area impunctate.

Sternites: Polished, with weak to obsolete minute punctures over most of surface and longitudinal rugae laterally.

Legs: Anterior tibia with subquadrate lobe at apex of lower margin (fig. 128); posterior leg (fig. 149) with a prominent knob near middle

of ventral margin of femur, and spines on posteroventral margin of tibia arising ventrally from prominent tubercles.

Terminalia: Apex of genital capsule prolonged, weakly emarginate, surface with scattered fine punctures; gonostylus as illustrated (fig. 272).

Length of body: 11.97.

TYPE DATA.—Described from holotype male in the collection of J. C. Lutz labeled "Nova Teutonia, Santa Catarina, Brazil, XII-24, 1950, F. Plaumann."

DISCUSSION.—The numerous, strong, unique modifications on the single specimen leaves no room for doubt concerning its validity as a new species. The trivial name alludes to the peculiar dilation of the anterior tibiae.

Dallasiellus (*Dallasiellus*) *fusus*, new species

PLATE FIGURE 273

DIAGNOSIS.—The fusing of the apex of the peritreme to the surrounding cuticula permits ready recognition of this species within the subgenus.

DESCRIPTION.—MALE: Four specimens. Oval, widest near midlength.

Head: Length about two-thirds width, 0.99(0.90–1.03):1.47(1.36–1.53); interocular width, 0.91(0.90–0.93); anterior outline a somewhat truncated semicircle, juga longer than and contiguous in front of clypeus; surface finely alutaceous, impunctate only in and immediately anterior to interocellar area, remainder of surface with numerous fine punctures and distinct, radiating rugae; jugum with submarginal row of close-set setigerous punctures extending little more than three-fourths of way to apex; ocelli small, separated from eye by space about three times ocellar width; jugum ventrally and maxillary plate, except basally, shining, impunctate. Antennal segments: I, 0.31(0.30–0.33); II, 0.33(0.33–0.33); III, 0.38(0.36–0.43); IV, 0.46(0.43–0.49); V, 0.51(0.50–0.53). Bucculae higher than labial II, evanescent posteriorly; labium attaining mesosternum or bases of middle coxae. Labial segments: I, 0.44(0.43–0.44); II, 0.77(0.69–0.83); III, 0.54 (0.52–0.58); IV, 0.41(0.38–0.46).

Pronotum: Length more than half width, 1.76(1.62–1.95):3.22 (3.06–3.39); anterior margin moderately, singly emarginate; lateral margin entire, straight on basal third, with seven to eleven setigerous punctures submarginally; transverse impression almost wholly absent, marked by irregular band of widely separated punctures; anterior lobe with numerous punctures laterally and few subapically, elsewhere with scattered minute punctures; posterior lobe with several punctures medially and laterally.

Scutellum: Longer than wide, 2.11(2.02–2.30):2.02(1.89–2.15); disc shining, with few widely scattered punctures, impunctate on basal fourth and apex.

Hemelytron: Clavus and corium alutaceous; clavus with two irregular, confused rows of punctures; mesocorium with one complete row and one incomplete row of punctures paralleling claval suture, discally with punctures sparse and scattered or numerous; exocorium punctured similarly to disc of mesocorium; costa with three or four setigerous punctures; membranal suture nearly straight, lateral angle sometimes weakly produced; membrane longer than basal width, just reaching apex of abdomen.

Propleuron: Finely alutaceous, punctured sparsely in depression and more abundantly anterior to acetabulum; prosternal carinae less than half as high as labial II.

Mesopleuron: Evaporatorium reaching into posterolateral angle but not to lateral margin of segment; lateral area with a few coarse punctures.

Metapleuron: Apex of peritreme fused with surrounding cuticula (as in fig. 106), not abruptly terminated; evaporatorium with lateral margin deeply concave, C-shaped, lateral area impunctate, extended almost to apex of peritreme.

Legs: Not specially modified.

Sternites: Shining, becoming more distinctly alutaceous laterally; laterally also with several longitudinal rugae.

Terminalia: Genital capsule shining, distinctly punctured in lateral angle, with broad submarginal depression laterally, apical margin entire, almost straight; gonostylus as illustrated (fig. 273).

Length of body: 6.22(5.97–6.66).

Female: Very similar to male.

Head: Length-width ratio, 0.98(0.90–1.06):1.50(0.36–1.58); interocular width, 0.98(0.89–1.03). Antennal segments: I, 0.32(0.30–0.36); II, 0.31(0.30–0.36); III, 0.39(0.36–0.43); IV, 0.48(0.43–0.53); V, 0.55(0.53–0.62). Labial segments: I, 0.45(0.42–0.46); II, 0.76(0.68–0.86); III, 0.55(0.53–0.60); IV, 0.41(0.40–0.43).

Pronotum: Length-width ratio, 1.80(1.56–2.02):3.21(2.93–3.52).

Scutellum: Length-width ratio, 2.19(2.02–2.60):2.10(1.75–2.60).

Length of body: 5.96(5.34–6.74).

Type data.—Holotype male and allotype female (both CalAc) labeled "12 miles S. E. Nochixtlan, Oax., Mex., XII–13–48, H. B. Leech collector." Paratypes, 2 males, 7 females, as follows:

Mexico: *Oaxaca:* Same data as types, 1 female (RCF). *Durango:* Coyotes, 8,300 feet, Aug. 8, 1947, D. Rockefeller Exp., Gertsch, 1 male (AmM). *México:* Tejupilco, June 16, 21, 27, 1933, H. E. Hinton and R. L. Usinger, 1 male, 2 females (RLU, RCF). *Distrito Federal:* 15 miles southeast of "El Guarda," Nov.

14, 1946, E. C. Van Dyke, 1 female (CalAc). *Jalisco:* Guadalajara, March 1923, 1 female (USNM). *Michoacán:* Ajuno, May 1923, W. M. Mann, 1 female (USNM). *State unknown:* Jalapa (USNM), "Tozi," November, 1 female (USNM).

Discussion.—The specific name alludes to the fusion of the apex of the peritreme with the surrounding cuticula. This character, as well as the numerous coarse crenulations on the posterior margin of the mesopleuron and the very deeply C-shaped metapleural evaporatorium (all similar to fig. 106) point out the close relationship of *fusus* to the slightly more northern species of the subgenus *Pseudopangaeus.* Although these three characteristics outweigh in number the single features of the interrupted mesopleural evaporatorium, the more logical placement of *fusus* is in subgenus *Dallasiellus.* To separate the two subgenera on the basis of the fused peritremal apex would permit placing the present species with its apparently close relatives of subgenus *Pseudopangaeus*, but would do violence to the distributional pattern by necessitating the transfer of *californicus* to *Dallasiellus* (*Dallasiellus*) as a geographically detached species. The presently accepted placement appears best in that it permits the more northern species to form a closely knit offshoot of the more southern subgenus by way of *fusus*. Further, *fusus* differs from all members of subgenus *Pseudopangaeus* in lacking an angulation near the base of the posteroventral margin of the posterior tibia of the male.

Dallasiellus (*Dallasiellus*) *horvathi*, new species

Diagnosis.—Among the large species (over 9 mm.) of the subgenus, *horvathi* may be recognized by the low prosternal carinae and the virtual lack of punctures on the posterior lobe of the pronotum.

Description.—From one male and one female. Male: Oval, widest near midlength.

Head: Length almost two-thirds width, 1.51:2.34; interocular width, 1.43; anterior outline a full semicircle, clypeus as long as juga; latter impunctate; almost smooth; submargin with four close-set setigerous punctures in front of eyes and one more widely spaced beyond; ocelli moderately large, situated about half way between eye and midline of head, separated from eye by a space nearly three times a transverse ocellar width; jugum ventrally and most of maxillary plate polished, impunctate. Antennal segments: I, 0.41; II, 0.56; III, 0.70; IV, 0.80; V, 0.90. Bucculae as high as labial II; labium reaching between hind coxae. Labial segments: I, 1.03; II, 1.66; III, 1.63; IV, 1.10.

Pronotum: Length more than half width, 3.13:5.43; anterior margin moderately, simply emarginate; side margins strongly sinuate opposite ends of transverse impression, submargin with row of six

setigerous punctures; transverse impression submedian, very weak, absent medially, marked by medially interrupted row of close-set punctures; anterior lobe with punctured lunate impression subapically, with about five punctures laterally; posterior lobe impunctate except for few punctures at middle near transverse impression.

Scutellum: Longer than wide, 3.34:3.24; disc polished, with irregularly spaced, moderately coarse, sunken punctures, apex impunctate.

Hemelytron: Corium and clavus polished, clavus with double row of punctures for more than half its length; mesocorium impunctate except for two complete rows paralleling claval suture and few punctures at lateroapical angle; exocorium with numerous distinct punctures for full length; membranal suture weakly concave, lateral angle slightly prolonged; costa with two setigerous punctures; membrane slightly surpassing apex of abdomen, length little more than basal width.

Propleuron: Polished, impunctate, even in depression; prosternal carinae low, about half as high as labial II.

Mesopleuron: Evaporatorium entire, reaching lateral margin of segment; lateral area impunctate.

Metapleuron: Evaporatorium occupying about three-fourths of segment; lateral area impunctate.

Sternites: Polished, impunctate.

Terminalia: Apical margin of genital capsule entire, faintly sinuate either side of middle, surface punctate in lateral depressions; gonostylus as illustrated for *bergi* (fig. 271).

Length of body: 10.22.

Female: Similar to male with the following exceptions: (1) Submarginal setigerous punctures on jugum normal on left side but with only three widely separated ones on the right; (2) ocelli larger, separated from eye by a space about twice the ocellar width; (3) lateral pronotal margin weakly sinuate opposite the ends of the transverse impression; (4) exocorial punctures less distinct; and (5) propleuron with some distinct punctures in the depression.

Head: Length-width ratio, 1.61:2.55; interocular width, 1.43. Antennal segments: I, 0.56; II, 0.60; III, 0.74; IV, 1.00; V, 1.05. Labial segments: I, 0.94; II, 1.50; III, 1.43; IV, 1.03.

Pronotum: Length-width ratio, 3.40:6.02.

Scutellum: Length-width ratio, 4.04:3.92.

Length of body: 11.17.

Type data.—The holotype male (AmM) is labeled "Moyobamba Region, Peru, Jan. 8, 1926, F 6149, H. Bassler Collection, Acc. 33591"; the allotype female (USNM) bears the following data: "Costa Rica,

Turrialba, collection Shild-Burgdorf" and a label "*Ectinopus holomelas*."

Discussion.—Although the type localities of the two specimens are somewhat removed from each other, the detected differences evident between the holotype and allotype are not sufficient to indicate specific distinctness.

Dallasiellus (Dallasiellus) interruptus, new species

Plate figures 108, 275

Diagnosis.—The shape of the mesopleural evaporatorium, which is interrupted near posterior margin (fig. 108), not only suggested the name for the species but is also reliable for separating it from all other species within the subgenus except *dilatipes*, which has highly polished coria.

Description.—From one male and one female. Male: Oval, widest at about mid-length.

Head: Length about two-thirds width, 1.56:2.29; interocular width, 1.36; anterior outline evenly curved, shallowly semicircular, clypeus as long as juga; latter with weak, radiating rugae with moderate punctures in between; submarginal setigerous punctures a row of four close-set punctures in front of eye and one more widely removed distally; ocelli moderately large, separated from eye by a space that is about 1½ times transverse ocellar width; jugum ventrally polished, impunctate; maxillary plate basally alutaceous, weakly punctate. Antennal segments: I, 0.46; II, 0.70; III, 0.56; IV, 0.84; V, 0.95. Bucculae as high as labial II; labium reaching between middle coxae. Labial segments: I, 0.96; II, 1.40; III, 1.40; IV, 0.96.

Pronotum: Length more than half width, 2.79:5.21; anterior margin deeply and doubly emarginate; side margins entire, not sinuate, with submarginal row of six setigerous punctures; transverse impression weak across full width, marked by punctured band which extends onto posterior lobe at middle; anterior lobe with numerous distinct punctures laterally and few in curved row behind anterior emargination.

Scutellum: Longer than wide, 3.71:3.13; polished, impunctate apically and at basal angles, discally with numerous, crowded, coarse punctures becoming finer toward apex.

Hemelytron: Corium and clavus distinctly alutaceous; latter with one complete and basal half of another longitudinal row of punctures; mesocorium and exocorium with numerous punctures over most of surface, former with two complete rows of slightly coarser punctures paralleling claval suture; costa with two setigerous punctures; membranal suture straight; membrane little longer than basal width, very slightly surpassing apex of abdomen.

Propleuron: Weakly alutaceous, punctured only in depression; prosternal carinae very low, sharp.

Mesopleuron: Evaporatorium reaching lateral margin along posterior edge of segment, interrupted near posterior margin of segment by polished band (fig. 108); lateral area impunctate.

Metapleuron: Evaporatorium with outer edge weakly concave; lateral area impunctate.

Sternites: Weakly alutaceous, with scattered punctures and short, longitudinal rugae on lateral third.

Legs: Moderately long.

Terminalia: Genital capsule entire apically, surface finely punctate in lateral impressed areas; gonostylus as illustrated (fig. 275).

Length of body: 10.27.

FEMALE: Very similar to male but with exocorium and mesocorium more sparsely punctate medially.

Head: Length-width ratio, 1.51:2.29; interocular width, 1.30. Antennal segments: I, 0.43; II, 0.66; III, 0.63; IV, 0.86; V, 0.94. Labial segments: I, 0.95; II, 1.46; III, 1.46; IV, 0.96.

Pronotum: Length-width ratio, 2.70:5.21.

Scutellum: Length-width ratio, 3.61:3.24.

Length of body: 10.30.

TYPE DATA.—Holotype male (Wien), "Unt. Amaz. Taperinha b. Santarem, 1–10, VI, '27, Zerny." Allotype female (Carv), "Paranha, Est. do Pará, 6–1–1920, coll. Doris Mender." Paratypes, 2 females, as follows:

BRAZIL: Santarém, 1 female (Carn).

ARGENTINA: Guadalupe, Santa Fé, Nov. 27, 1939, Biraben-Bezzi, 1 female (UnivNac).

DISCUSSION.—The shape of the mesopleural evaporatorium is very suggestive of the condition found in the subgenus *Pseudopangaeus*, but differs in that the extreme posterior part extends thinly to lateral margin of the segment (fig. 108), thus allying this species to subgenus *Dallasiellus*. It also differs from *Pseudopangaeus* in having only fine crenulations on the posterior margin of the mesopleuron, in not having the lateral margin of the matapleural evaporatorium deeply concave, and in having the posterior tibia of the male simple.

Dallasiellus (*Dallasiellus*) *levipennis* (Signoret), now combination

PLATE FIGURE 27

Geotomus levipennis Signoret, 1883, p. 35, pl. 2, fig. 144.
Geocnethus prosternalis Horváth, 1919, p. 246. New synonymy.

DIAGNOSIS.—This species is characterized by its complete, uninterrupted mesopleural evaporatorium and lobulate prosternal carinae (fig. 27), which are as high or higher than labial II.

Description.—No detailed description of this species is warranted until such time as material is available in sufficient quantity to permit proper evaluation of the variation characterizing the few specimens examined in the course of this study. If, when such material becomes available, it can be demonstrated that the variations are such as distinguish population segregates that conform to our accepted species concept, meaningful descriptions of *prosternalis*, *levipennis*, and any other species of the complex can be prepared.

Type data.—Horváth's types of *prosternalis* were from "Brasilia: Minas Geraes . . . , Cuyaba in prov. Matto Grosso." The Cuyaba specimen (Hung), bearing the "Typus" label, was studied by the present author. The type specimens of *levipennis* were from "Cajenne," French Guiana, and "Amazones," Brazil; their locations are unknown.

Distribution of specimens studied.—The seven males and three females studied came from northern South America, ranging from Panama to Ecuador on the west and through Venezuela to central Brazil on the east.

Discussion.—Because of the limited number of specimens available for this study and the number and nature of the variations in structure among them, they are here placed under *prosternalis* for reasons of nomenclatorial convenience. Indications are that two or more species are represented in a complex of closely related species. The following comments indicate the nature and direction of the variations shown by different structures and, in a general way, provide information descriptive of the complex.

The head shows several types of variations: (1) anterior outline varies from a flattened semicircle through a full semicircle to a semicircle slightly prolonged anteriorly; (2) surface with no punctures or numerous scattered minute punctures; (3) jugum with submarginal punctures variously arranged with two close-set punctures in front of eye and one puncture strongly separated apically (fig. 43), these sometimes appearing in various combinations on the two sides of one individual; (4) labium varying in length from between middle coxae to between posterior coxae. In all specimens the pronotum has the transverse impression weak but marked with a row of distinct punctures, but the two lobes vary from impunctate laterally to strongly abundantly punctate; all males showed a decided sinuation of the side margin opposite the ends of the transverse impression. The hemelytron varies in surface texture from highly polished to distinctly alutaceous, and in punctation from impunctate (except for usual row in clavus, one or two rows on mesocorium paralleling claval suture, and punctures in impressions delimiting veins) to punctate apically or for full length of exocorium. The scutellum varies from weakly to very coarsely punctured and in one specimen shows a

strong, submarginal carina. The prosternal carinae are strongly lobulate in all, but the shape of this lobe varies from a nearly full semicircle to a shape much longer than broad. The sternites may be polished or weakly to strongly alutaceous. The male genital capsule is relatively unmodified in all except that in each it shows a weak, triangular impression subapically and punctate laterally. The length of the body varies from 9.6 to 11.9 mm.

The taxonomic significance of these variations can only be determined through study of additional material. In the present author's opinion, the variations probably indicate the existence of additional species, but the evidence is not conclusive and it seems best to attempt no further divisions at this time.

Dallasiellus (*Dallasiellus*) *longulus* (Dallas)

Plate figures 16, 25, 41, 107, 129, 150, 276

Aethus longulus Dallas, 1851, p. 119.—Walker, 1867, p. 152.—Stål, 1876, p. 26.
Stenocoris longulus Signoret, 1880, p. xliv; 1882, p. 242, pl. 8, fig. 102.—Distant, 1880, p. 5.—Uhler, 1886, p. 3.—Lethierry and Severin, 1893, p. 69.
Dallasia longulus Bergroth, 1891, p. 235.
Dallasiellus longulus Berg, 1901, p. 281.

Diagnosis.—The very elongate, parallel-sided form or, more usable, the long labium which surpasses apices of posterior coxae will separate this species from all other members of the subgenus.

Description.—Male: Elongate, parallel-sided.

Head (fig. 41): Length about three-fourths width, 1.25(1.20–1.30): 1.71 (1.66–1.74); interocular width, 1.04(1.00–1.08); juga rounded, forming a slightly flattened semicircle, as long as clypeus and distinctly narrowing it apically; the marginally carinate jugum has three submarginal setigerous punctures—one immediately anterior to eye and two near midlength; surface weakly convex, faintly rugose radially and with several scattered distinct punctures; ocelli well developed, separated from eye by about twice an ocellar width; jugum ventrally smooth, impunctate; maxillary plate with several distinct punctures, these more abundant posteriorly. Antennals: I, 0.38(0.36–0.39); II, 0.46(0.44–0.50); III, 0.43(0.42–0.45); IV, 0.56 (0.53–0.60); V, 0.65(0.63–0.68). Bucculae about as high at labial II; labium reaching to first or base of second sternite. Labial segments: I, 0.70(0.68-0.73); II, 1.25(1.16–1.33); III, 1.29(1.20–1.40); IV, 1.03 (1.00–1.06).

Pronotum: Length more than half width, 1.92(1.82–1.95):3.47 (3.31–3.62); anterior margin doubly but moderately deeply emarginate; side margins entire, with submarginal row of five setigerous punctures, one of which is posterior to transverse impression; latter slightly behind middle, shallow, interrupted medially, marked by

irregular row of distinct punctures; anterior lobe impunctate except in subapical crescentic impression and in wide lateral band; posterior lobe with most punctures grouped at middle.

Scutellum: Longer than wide, 2.78(2.73–2.86):2.18(2.08–2.24); surface with numerous scattered, irregular punctures (except across base) becoming finer toward impunctate apex.

Hemelytron: Corial areas well defined, surface shining to vaguely alutaceous; exocorium and mesocorium punctured full length, punctures becoming coarser basally, mesocorium with one complete, sunken row and one incomplete row of close-set punctures paralleling claval suture; clavus with a single row of punctures; costa with one setigerous puncture; membranal suture nearly straight, outer angle slightly acute.

Propleuron: Punctate in depression; prosternal carinae strongly raised in anterior half of prosternum, in profile forming a somewhat semicircular lobe (fig. 25).

Mesopleuron (fig. 107): Evaporative area reaching to posterolateral angle of segment, thence extended anteriorly along lateral margin; lateral area feebly rugose, impunctate; posterior margin entire.

Metapleuron (fig. 107): Evaporative area occupying more than mesal three-fourths, lateral margin straight, oblique; lateral area impunctate, with impressed line close to and paralleling outer edge of evaporative area; osteolar canal reaching half way across segment.

Legs (figs. 129, 150): Not specially modified.

Sternites: Shining, laterally roughened by weak rugae and patches of very small tubercules.

Terminalia: Subgenital plate flared laterally near base, apex with a slight emargination; gonostylus as illustrated (fig. 276).

Length of body: 6.91(6.73-7.14).

FEMALE: Very similar to male; measurements averaging slightly smaller.

Head: Length-width ratio, 1.18(1.16–1.20):1.71(1.63–1.75); interocular width, 1.05(1.03–1.10.) Antennal segments: I, 0.34(0.30–0.38); II, 0.47(0.43–0.50); III, 0.41(0.39–0.46); IV, 0.56(0.52–0.60); V, 0.62(0.60–0.64). Labial segments: I, 0.68(0.63–0.73); II, 1.28(1.20–1.33); III, 1.32(1.26–1.38); IV, 1.02(1.00–1.03).

Pronotum: Length-width ratio, 1.87(1.79–1.95):3.36(3.13–3.52).

Scutellum: Length-width ratio, 2.76(2.60–2.86):2.08(1.95–2.16).

Length of body: 6.87(6.50-7.16).

TYPE DATA.—Dallas' type (BrM) came from Pará, Brazil.

SPECIMENS STUDIED.—5 males, 8 females, as follows:

BRAZIL: *Pará:* Pará, Uhler collection, 1 male, 2 females (USNM). Taperina, near Santarém, August 1927, Zerny, 1 male (USNM). Santarém, 1 female (Car).

BOLIVIA: *Sara:* No exact locality, Steinbach, 2 males, 2 females (Carn; MCZ). *Santa Cruz:* Puerto Suárez, 150 meters, Steinbach, Acc. 3845, 1 female (Carn).

PARAGUAY: Gran Chaco, 260 kilometers west of Paraguay River, Nov. 10, 1936, A. Schulze, 2 females (JCL). Villarrica, September 1935, F. Schade, 1 male (USNM).

DISCUSSION.—This species furnishes an excellent example of the superficiality of the approach to genera that has been commonly employed in many of the studies of the Cydnidae. On the basis of a slightly more elongate shape and a lengthened labium, this species served as the type of a monobasic genus. The genus has stood with this single species for more than seventy years, even though several really closely allied species have been described during that period. Many workers have been misled by such specific differences which are more conspicuous in a superficial scanning of a few species at a time than are the more important features of the trichobothria and osteolar peritreme. But such results must be expected when workers are interested in cataloging and describing all the forms possible—the differences being accorded more importance than the similarities.

Dallasiellus (Dallasiellus) lugubris (Stål), new combination

PLATE FIGURES 42, 43, 274

Aethus lugubris Stål, 1860, p. 13.
Geotomus obscurus Signoret, 1883, p. 39, pl. 2, fig. 147. New synonymy.
Geotomus nigrocinctus Signoret, 1883, p. 40, pl. 2, fig. 148. New synonymy.
Geotomus semilevis Signoret, 1883, p. 44, pl. 3, fig. 153. New synonymy.
Geotomus pangaeoides Signoret, 1883, p. 45. New synonymy.
Geocnethus reversus Barber and Bruner, 1932, p. 237, pl. 25, fig. 1. New synonymy.

DIAGNOSIS.—Within its subgenus this species may be recognized by the small size (3.9–5.5) coupled with the presence of two or more close-set setigerous punctures in front of eye on submargin of head and two almost equally developed rows of mesocorial punctures paralleling the claval suture.

DESCRIPTION.—MALE: Oval, broadest near midlength.

Head: Length less than three-fourths width, 0.84(0.82–0.86) : 1.29 (1.26–1.32); interocular width, 0.77(0.76–0.80); anterior outline semicircular, juga very slightly longer than clypeus and strongly narrowing it apically; surface polished, impunctate, and with faint, radiating rugae; two to four close-set submarginal setigerous punctures immediately in front of eye and usually two widely separated ones beyond them; ocelli distinct, separated from eye by a space equal to or slightly greater than their own diameter; juga ventrally and maxillary plate polished, impunctate. Antennal segments: I, 0.23(0.23–0.24); II, 0.24(0.23–0.26); III, 0.30(0.29–0.31); IV, 0.35(0.35–0.36); V, 0.42(0.41–0.42). Bucculae about as high as labial II, evanescent posteriorly; labium reaching between middle coxae. Labial segments:

I, 0.39(0.37–0.43); II, 0.63(0.60–0.66); III, 0.45(0.43–0.46); IV, 0.37(0.35–0.40).

Pronotum: Length slightly more than half width, 1.36(1.32–1.44) : 2.56(2.47–2.63); anterior margin weakly, doubly emarginate; side margins entire, gently curving on anterior third, with six submarginal setigerous punctures; transverse impression more or less impressed laterally, obsolete medially; anterior lobe with a curved, irregular band of distinct punctures subapically and a patch of numerous coarse punctures laterally; posterior lobe with several distinct punctures medially and laterally.

Scutellum: Longer than wide, 1.75(1.62–1.85) : 1.59(1.56–1.64); disc polished and with numerous scattered punctures becoming finer apically.

Hemelytron: Corium and clavus polished; clavus with one complete row and one incomplete row of punctures; mesocorium with two complete rows of punctures paralleling clavocorial suture, elsewhere distinctly punctured basally and apically and much more finely so medially; exocorium for its full length more densely punctate than mesocorium; costa with one to three setigerous punctures; coriomembranal suture nearly straight; membrane slightly longer than basal width, distinctly surpassing apex of abdomen.

Propleuron: Distinctly punctured only in the depression; prosternal carinae less than half as high as labial II.

Mesopleuron: Evaporatorium reaching lateral margin and extended anteriorly; polished area impunctate.

Metapleuron: Peritreme free apically; evaporatorium virtually straight laterally; polished area impunctate.

Sternites: Shining, impunctate except for a few punctures behind spiracles.

Terminalia: Genital capsule with a shallow but distinct medioapical emargination; surface with a few small punctures laterally.

Length of body: 5.02(4.64–5.11).

Female: Very similar to male.

Head: Length-width ratio, 0.84(0.80–0.90) : 1.27(1.20–1.36); interocular width, 0.76(0.73–0.80). Antennal segments: I, 0.22(0.20–0.24); II, 0.25(0.23–0.27); III, 0.28(0.26–0.30); IV, 0.34(0.30–0.36); V, 0.41(0.40–0.43). Labial segments: I, 0.38(0.36–0.41); II, 0.62(0.56–0.69); III, 0.49(0.46–0.53); IV, 0.41(0.40–0.43).

Pronotum: Width-length ratio, 2.50(2.31–2.74) : 1.33(1.30–1.37).

Scutellum: Length-width ratio, 1.70(1.56–1.89) : 1.53(1.43–1.75).

Length of body: 4.79(3.98–5.50).

Type data.—Stål's type (Stock) of *Aethus lugubris* was from Rio de Janeiro. Signoret's type (Wien) of *nigrocinctus* was from "Bresil"; his type (Wien) of *obscurus* was from "Ocana," Colombia, his type

(not now in Distant or Signoret collections) of *semilevis* was from "Mexique"; and his type (not yet located) of *pangaeoides* was from "Guayra et du Mexique." The Barber and Bruner type (USNM) was from "Mayaguez, Puerto Rico."

Specimens studied: 39 males, 84 females:

United States: *Alabama*: Mobile; November. *Louisiana:* Gueydan, Morgan City; June, July. *Mississippi:* Harrison Co.; August. *Texas:* Brazos Co., Brownsville, Harlingen, Mission, Victoria, Weslaco; March, May, June, September, October, November.

Mexico: *Veracruz:* Córdoba, Pureza, Tres Zapotes; April, September. *Yucatán:* Mérida; June.

Guatemala: Coban; July.

Nicaragua: La Calera; September.

Costa Rica: San José; June.

Panama: *Canal Zone:* Barro Colorado Island; April to December.

Brazil: Chapada, Rio de Janeiro, Santarém, Taperina; February, November, December.

Bolivia: Santa Cruz de la Sierra; January, November.

Argentina: San Pedro de JuJuy; July.

Puerto Rico: Gurabo, Río Piedras, Vieques; April, November.

Discussion.—The author proposes the above synonomy because it has not been possible in this study to differentiate population segregates based on discontinuities in variation of anatomical structures. A frustrating array of variations are shown by the specimens which in the key run to *lugubris*. The gonostyli likewise offer no help in separating these specimens, as they appear similar (fig. 275) in all parts of the geographic range. The above variations all extend uninterruptedly from one extreme of geographic range to another, and occur in unpredictable combinations from one locality to another.

The geographic range, although greater than that known for any other species in the Western Hemisphere, has satisfactory specimen representation from all its main areas. Some localities are represented by goodly series of specimens. It is in these larger series that the combinations of variations, although appearing to tend in certain directions, are most confusing. This geographic picture is even more complicated by the spotty occurrences of these "tendencies" within groups; i.e., the specimens from the southern United States appear more similar in combinations to some of the Brazilian groups than to the Mexican or West Indies specimens.

When an intense study of this kind reveals no way to separate such an array into definable taxonomic categories, there is reason to surmise that perhaps the specimens all belong to one species. Supporting this possibility is the fact that this part of the family represents the least specialized portion. To begin with, *Dallasiellus* is a "residual" genus that appears at the end of the key after all the more strongly marked genera have been removed. Then, within the

genus the specimens under consideration also appear at the end of the key after all the more readily recognized species have been separated. Thus, a point of relatively little differentiation is reached and further separation becomes very difficult.

Perhaps this melange could be treated as a "Rassenkreis"; however, the nature and geographic distribution of the variation exhibited by the specimens studied does not conform to that required by the accepted definition of a polytypic species. In view of these considerations the most practical arrangement is to treat these specimens as one species, unless and until investigation of additional characters in the phallosome and the internal female genitalia reveal means for their separation into additional species. Until this is accomplished, Stål's name *lugubris* has priority over the other names that have been applied to specimens belonging to this complex.

Dallasiellus (Dallasiellus) murinus **(Van Duzee), new combination**

PLATE FIGURE 277

Geotomus murinus Van Duzee, 1933, p. 26.

DIAGNOSIS.—Among those species that are less than 6 mm. in length and have three widely separated setigerous punctures on the submargin of the head, this species may be detected by the single setigerous puncture on the costa, the polished mesocorium and the longitudinal impression on each jugum.

DESCRIPTION.—From four males and four females. MALE: Elongate-oval, sides subparallel.

Head: Length about two-thirds width, 0.86(0.80–0.91):1.26(1.22–1.32); interocular width, 0.77(0.76–0.80); anterior outline semicircular, clypeus as long as jugum, strongly narrowed apically; surface shining, with numerous, well scattered, minute punctures; jugum with longitudinal, obtuse impression medially, this marked laterally by longitudinal tumid elevation anterior to eye, with three widely separated setigerous punctures submarginally; ocelli small, separated from eye by space equal to or 1½ times transverse ocellar width; jugum ventrally and maxillary plate (except basally) shining, impunctate. Antennal segments: I, 0.28(0.26–0.30); II, 0.32(0.30–0.36); III, 0.35(0.33–0.36); IV, 0.45(0.42–0.49); V, 0.50(0.47–0.54). Bucculae about as high as labial II, evanescent posteriorly; labium reaching between middle coxae. Labial segments: I, 0.44(0.43–0.46); II, 0.81(0.69–0.73); III, 0.54(0.50–0.60); IV, 0.31(0.29–0.36).

Pronotum: Length slightly more than half width, 1.31(1.23–1.38):2.55(2.47–2.60); anterior margin moderately doubly emarginate; lateral margin entire, straight on basal half, with six setigerous punctures submarginally; transverse impression postmedian, dis-

tinctly impressed across full width, except sometimes more weakly so medially, marked by regular row of distinct, close-set punctures; subapical impression moderate, with numerous coarse and minute punctures; anterior lobe laterally with mixture of numerous coarse and minute punctures; posterior lobe with numerous widely separated minute punctures over full width and few coarse ones medially and laterally.

Scutellum: Longer than broad, 1.82(1.75–1.89):1.58(1.49–1.62); shining, with numerous scattered minute punctures, with several coarse ones discally but not across base or apex.

Hemelytron: Clavus and corium polished; clavus polished, with one complete and sometimes a second partial row of coarse punctures; mesocorium with two complete rows of punctures paralleling claval suture and finer ones scattered widely over disc; exocorium punctured full length, punctures coarser and sparser on mesal half; membranal suture straight, lateral angle not or faintly produced; membrane longer than basal width, reaching or just surpassing apex of abdomen.

Propleuron: Polished, punctate in depression and anterior to acetabulum; prosternal carinae less than half as high as labial II.

Mesopleuron: Evaporatorium not interrupted; lateral area impunctate, with obsolete oblique rugae.

Metapleuron: Peritreme abruptly terminated apically; lateral margin of evaporatorium weakly concave; lateral area impunctate.

Sternites: Shining, with very minute punctures scattered over full width; moderately rugopunctate in spiracular area.

Legs: Not specially modified.

Terminalia: Genital capsule more densely punctate laterally, apical margin broadly and very shallowly emarginate medially; gonostylus as illustrated (fig. 277).

Length of body: 5.23(5.09–5.41).

Female: Very similar to male, measurements averaging larger.

Head: Length-width ratio, 0.90(0.86–0.93):1.35(1.31–1.38); interocular width, 0.81(0.76–0.85). Antennal segments: I, 0.27(0.26–0.30); II, 0.30(0.30–0.32); III, 0.34(0.33–0.38); IV, 0.45(0.43–0.46); V, 0.53(0.53–0.54). Labial segments: I, 0.42(0.40–0.44); II, 0.79(0.70–1.00); III, 0.53(0.52–0.56); IV, 0.35(0.35–0.36).

Pronotum: Length-width ratio, 1.35(1.30–1.43):2.66(2.51–2.76).

Scutellum: Length-width ratio, 1.95(1.83–2.05):1.64(1.50–1.75).

Length of body: 5.33(4.97–5.55).

Type data.—The type female (CalAc) is from "Tagus Cove, Albemarle Island," in the Galápagos Islands.

Specimens studied.—4 males, 4 females, as follows:

Ecuador: Bucay (?), Mar. 19, 1922, G. Tate, 900 feet, 2 females (USNM). Guayaquil, 1940, C. L. Fagan, 1 male (USNM).

GALÁPAGOS ISLANDS: Galápagos Island, Pinchot Exp., June 1929, A. K. Fisher, 2 males, 2 females (RCF, USNM). Chatham Island, June 30, 1933, 1 male (JCL).

DISCUSSION: The distribution of *murinus* presents an interesting problem. Here is a species occurring in two areas separated by some 600 miles of ocean barrier. Is its appearance on the Galápagos Islands due to the ocean currents that flow from the mainland to the islands, or was man and his machines the agent of dissemination? Either way, it is interesting to note that Van Duzee's species is not one of the animals of the Galápagos Islands whose range is restricted to them.

Dallasiellus (Dallasiellus) orchidiphilus, new species

PLATE FIGURE 278

DIAGNOSIS.—This new species is most easily recognized from all other species within the genus by the very short second antennal segment, which is distinctly shorter than the first and just about half as long as the third.

DESCRIPTION.—MALE: Oval, widest slightly posterior to mid-length.

Head: Length about two-thirds width, 0.74(0.70–0.86):1.12(1.10–1.16); interocular width, 0.69(0.67–0.70); anterior outline less than a semicircle, clypeus as long as juga and slightly narrowed apically; surface weakly convex, shining, with few minute punctures anterior to each ocellus and obsolete rugae subapically; jugum with one submarginal setigerous puncture next to eye and one or two short, stout pegs at apex; ocelli small, separated from eye by space almost three times transverse ocellar diameter; jugum ventrally and maxillary plate shining, impunctate. Antennal segments: I, 0.25(0.23–0.26); II, 0.15(0.14–0.17); III, 0.31(0.30–0.33); IV, 0.32(0.31–0.33); V, 0.41(0.40–0.43). Bucculae almost as high as labial II; labium reaching between middle coxae. Labial segments: I, 0.39(0.36–0.41); II, 0.57(0.53–0.61); III, 0.45(0.43–0.48); IV, 0.32(0.30–0.36).

Pronotum: Length about half width, 1.18(1.10–1.23):2.39(2.21–2.53); anterior margin shallowly emarginate; side margin entire, not sinuate, with four or five submarginal setigerous punctures; transverse impression marked by irregular, medially interrupted band of strong punctures; anterior lobe with large punctures paralleling anterior margin and in large patch laterally, and with numerous minute punctures intermixed with large ones to form a line either side of midline and scattered over calli; posterior lobe with scattered large punctures discally and in patch laterally, with few minute punctures scattered over surface.

Scutellum: Length equal to or little longer than width, 1.48 (1.36–1.62):1.45(1.36–1.55); disc shining, with few coarse punctures or none, and numerous weak, minute punctures.

Hemelytron: Corium and clavus feebly alutaceous; clavus with one row of punctures; mesocorium with distinct punctures scattered over disc and two complete rows paralleling claval suture; exocorium punctured similarly or a little more closely than mesocorium; costa with one setigerous puncture; membranal suture straight, lateral angle not prolonged; membrane about as long as basal width, reaching or slightly surpassing apex of abdomen.

Propleuron: Shining, with few punctures ventrally in depression; prosternal carinae less than half as high as labial II.

Mesopleuron: Evaporatorium reaching into posterolateral angle but not to lateral margin; lateral area with several distinct punctures.

Metapleuron: Peritreme abruptly terminated apically; lateral margin of evaporatorium straight; lateral area impunctate.

Legs: Not specially modified.

Sternites: Shining, impunctate except near apex of VI.

Terminalia: Genital capsule distinctly punctate except medio-apically, apical margin virtually straight; gonostylus as illustrated (fig. 278).

Length of body: 4.18(3.93–4.47).

Female: Very similar to male.

Head: Length-width ratio, 0.69(0.66–0.73):1.10(1.03–1.16); interocular width, 0.68(0.65–0.71). Antennal segments: I, 0.24(0.23–0.26); II, 0.14(0.14–0.16); III, 0.30(0.28–0.33); IV, 0.35(0.33–0.37); V, 0.43(0.40–0.48). Labial segments: I, 0.38(0.36–0.40); II, 0.56(0.53–0.60); III, 0.45(0.44–0.46); IV, 0.34(0.33–0.35).

Pronotum: Length-width ratio, 1.17(1.10–1.33):2.42(2.15–2.53).

Scutellum: Length-width ratio, 1.49(1.36–1.63):1.39(1.30–1.49).

Length of body: 4.08(3.78–4.63).

Type data.—Holotype male (USNM 64413) labeled "Colombia, on *Cattleya*, intercepted Honolulu, VII–9–37," and allotype female (USNM) labeled "Colombia, on orchid, intercepted San Francisco, Cal., II–1–39." Paratypes: 4 males, 3 females, as follows:

Panama: Summit, Canal Zone, January 1947, N. L. H. Krauss, 1 female (USNM).

Colombia: Bogotá, Nov. 30, 1921, F. H. B. #32857, 1 male (USNM). *Intercepted on orchids:* Hoboken, N.J., Sept. 25, 1940, 1 male (USNM). Washington, D.C., Jan. 13, 1940, 1 male (USNM); Nov. 14, 1936, 1 female (USNM); June 7, 1938, 1 male (RCF). San Francisco, Calif., Aug. 22, 1945, 1 female (USNM).

Discussion.—The trivial name was given on the basis of the numerous interceptions of this form on orchids. The several specimens for which the host orchid was determined all came from *Cattleya*, a tree-inhabiting orchid genus. This habit of frequenting an orchid that grows on trees probably accounts in great part for the fact that only two of the nine specimens seen had been collected in

their native haunts; the other seven were found in a specialized form of collecting in which the orchids were examined after having been shipped from their countiy of origin. Collecting on *Cattleya* in Central and South America should yield many more specimens.

Dallasiellus (Dallasiellus) ovalis, new species

Diagnosis.—Among the smaller species (not over 5.5) with the three widely separated setigerous punctures in fiont of the eye, this species may be recognized by the lack of costal setigerous punctures and the obsolete transverse pronotal impression.

Description.—Based on three females. Oval.

Head: Length two-thirds width, 0.80(0.76–0.83) : 1.24(1.23–1.26); interocular width, 0.78(0.76–0.81); anterior outline a flattened semicircle, clypeus as long as juga, narrowed apically; surface shining, impunctate, with three widely-separated submarginal setigerous punctures; ocelli small, separated from eye by space more than three times transverse ocellar width; jugum ventrally and maxillary plate, except basal third, polished, impunctate. Antennal segments: I, 0.20(0.20–0.20); II, 0.20(0.20–0.20); III, 0.29(0.26–0.33); IV, 0.36(0.36–0.36); V, 0.47(0.47–0.48). Bucculae almost as high as labial II; labium reaching between middle coxae. Labial segments: I, 0.43(0.40–0.45); II, 0.70(0.70–0.72); III, 0.54(0.50–0.60); IV, 0.32(0.30–0.33).

Pronotum: Length more than half width, 1.36(1.36–1.38) : 2.47 (2.44–2.53); anterior margin shallowly, singly emarginate; side margins entire, straight on basal two-thirds, with four or five submarginal setigerous punctures; transverse impression postmedian, obsolete, marked by very irregular row of numerous punctures; both lobes laterally with numerous punctures; anterior lobe with curved row of punctures paralleling anterior emargination; posterior lobe with distinct punctures scattered across most of disc.

Scutellum: Longer than wide,1.73(1.12–1.90):1.51(1.49–1.56); disc polished, with a number of well-separated moderate punctures becoming finer apically.

Hemelytron: Clavus and corium polished; clavus with two longitudinal rows of punctures; mesocorium coarsely punctured toward base, more finely and sparsely so toward apex, with two complete rows of punctures paralleling claval suture; exocorium with punctures crowded for full length; costa with no setigerous punctures; membranal suture straight, lateral angle faintly prolonged; membrane longer than basal width, slightly surpassing apex of abdomen.

Propleuron: Shining, punctate only in depression; prosternal carinae less than half as high as labial II.

Mesopleuron: Lateral area impunctate, lightly obliquely rugose.

Metapleuron: Peritreme abruptly terminated apically; lateral margin of evaporatorium straight to faintly convex; lateral area impunctate.

Sternites: Polished, impunctate, with few short, longitudinal rugae in spiracular area.

Legs: Not specially modified.

Length of body: 4.79(4.65–4.92).

TYPE DATA.—Holotype female (JCL), "Nova Teutonia, Santa Catarina, Brazil, X–16, 1950, F. Plaumann." Paratypes: Same data as type, 1 female (JCL); same locality and collector as type, Aug. 15, 1935, 1 female (RLU).

DISCUSSION.—None of the specimens examined bore any biological data.

Dallasiellus (Dallasiellus) planicollis (Horváth), new combination

PLATE FIGURE 280

Geocnethus planicollis Horváth, 1919, p. 247.

DIAGNOSIS.—Among the large species which make up the group centering about *bergi* (key couplets 7 to 9), this species may be recognized by a combination of several characters: low prosternal carinae, corium alutaceous and with but a few exocorial punctures which are confined to apex, and the numerous coarse, scutellar punctures.

DESCRIPTION.—Based on one specimen, the type male. Oval.

Head: Broader than long, 2.25:1.43; interocular width, 1.30; clypeus as long as juga, slightly narrowed at apex; juga longitudinally impressed medially with four submarginal setigerous punctures—two close-set ones in front of eye and two widely-spaced ones beyond; ocelli large, width subequal to space separating them from eye. Antennal segments: I, 0.45; II, 0.60; III, 0.63; IV, 0.91; V, missing. Maxillary plate punctate on basal half; bucculae moderately high; labium reaching between middle coxae. Labial segments: I, 1.05; II, 1.33; III, 1.20; IV, 0.88.

Pronotum: Wider than long, 5.21:2.83; sides tapering from base, markedly sinuate medially; anterior margin deeply emarginate, with a bordering broad, punctate impression; transverse impression slightly behind middle, vaguely impressed, with an irregular row of coarse punctures that curve forward medially; anterior lobe with a few punctures laterally; posterior lobe impunctate except for few moderate punctures medially; prosternal carinae low, in profile angulately rounded.

Scutellum: Longer than wide, 3.42:3.28; discally with more than 35 coarse, sunken punctures crowded to form coarse, transverse rugae between them.

Hemelytron: Corium finely but distinctly alutaceous; exocorium with few moderate punctures near base and apex; mesocorium impunctate except for rows bordering claval suture; clavus with one complete row and one incomplete row of punctures; costa with two setigerous punctures; membrane reaching apex of abdomen, longer than basal width.

Mesopleuron: Evaporatorium reaching uninterrupted to posterolateral angle of segment; posterior margin entire.

Metapleuron: Lateral margin of evaporatorium gently concave.

Legs: Posterior femur not tuberculate medioventrally; posterior tibia simple.

Sternites: Polished, impunctate except along basal margin and near spiracles.

Terminalia: Genital capsule with posterior margin faintly emarginate either side of broad, blunt apex; gonostylus as illustrated (fig. 280).

Length of body: 10.35.

Type data.—Holotype male (Hung), "Brasilia: Rio de Janeiro."

Specimens studied: 2 males, as follows:

Brazil: Rio de Janeiro, type male (Hung) and another male (Hung) with same data.

Discussion.—This species, like most of the other large species of the subgenus (in couplets 7–9 of the key to species), is represented by very limited material—one specimen in this case. With such limited material the worker has little chance to evaluate the differences that do appear. Until more specimens become available these species must be accepted.

Dallasiellus (*Dallasiellus*) *puncticeps*, new species

Plate figure 281

Diagnosis.—The coarse, close-set punctures on the surface of the head plus the abrupt posterior termination of the bucculae mark *puncticeps* from all others in the subgenus.

Description.—Based on one male. Elongate-oval, almost parallel-sided, widest behind midlength.

Head: Length almost two-thirds width, 1.16:1.81; interocular width, 1.03; anterior outline semicircular, juga longer than and contiguous beyond clypeus; surface depressed either side of midline, coarsely and subrugosely punctate over most of surface posteriorly to ocellar area; jugum with one setigerous puncture immediately anterior to eye; ocelli large, separated from eye by space subequal to transverse diameter of ocellus; jugum ventrally polished, impunctate; maxillary plate coarsely punctured, more densely so on basal third.

Antennal segments: I, 0.38; II, 0.50; III, 0.53; IV, 0.64; V, 0.79. Bucculae much higher than labial II, abruptly and roundly terminated posteriorly; labium reaching past middle of mesosternum. Labial segments: I, 0.61; II, 1.02; III, 0.88; IV, 0.79.

Pronotum: Length less than half width, 2.06:4.36; anterior margin shallowly, singly emarginate; side margin entire, somewhat flattened on middle third, with submarginal row of four or five setigerous punctures; transverse impression median, obsolete, emphasized anteriorly by slightly tumid calli; with irregular row of large punctures; anterior lobe with crowded large punctures in band paralleling anterior emargination, in broad lateral area and in small patch on midline; posterior lobe with numerous punctures becoming finer posteriorly, absent on hind and margin and umbone.

Scutellum: Longer than wide, 3.26:2.47; disc polished, punctured over full length, more finely so toward apex.

Hemelytron: Clavus and corium obsoletely alutaceous; clavus with double row of punctures on basal half and a single row on apical half; mesocorium distinctly punctured over full length, more densely so apically, with two rows of punctures paralleling claval suture, outer row of more widely separated punctures; exocorium for full length more densely and coarsely punctate than mesocorium; costa without setigerous punctures; membranal suture weakly bisinuate, lateral angle slightly produced; membrane longer than basal width, surpassing abdomen by about one-fourth its length.

Propleuron: Polished, with few coarse punctures in depression and smaller punctures on posterior convexity and anterior convexity laterally; prosternal carinae about half as high as labial II.

Mesopleuron: Evaporatorium reaching lateral margin in posterolateral angle; lateral area longitudinally rugopunctate.

Metapleuron: Peritreme abruptly terminated apically; evaporatorium delimited laterally by impressed line; lateral area impunctate.

Sternites: Weakly alutaceous, with minute punctures scattered over most of surface and coarser ones laterally.

Legs: Posterior femora ventrally with numerous transverse tubercles basad of large, blunt, subapical angulation; posterior tibiae elongate, about 1½ times as long as femora, slender and gently curved in apical half.

Terminalia: Genital capsule alutaceous, with numerous fine punctures over most of surface, apical margin with broad, weak emargination medially and gonostylus as illustrated (fig. 281).

Length of body: 8.85.

Type data.—Holotype male (Wien), "Espírito-Santo, Brasil, ex coll. Fruhstorfer."

Discussion.—The trivial name of this new species obviously refers to the very strongly punctured head, a character shared with only one other species, *solitaria*, within the subgenus.

Dallasiellus (Dallasiellus) solitaria (Horváth), new combination

Plate figure 282

Colobophrys solitaria Horváth, 1919, p. 244.

Diagnosis.—Within the genus this species may be most readily recognized by the coarsely rugopunctate head and the posteriorly evanescent bucculae.

Description.—Male: Based on three specimens. Oblong-oval. Head: Length two-thirds width, 1.41(1.36–1.49):1.98(1.95–2.02); interocular width, 1.10; juga shallowly curved, forming an elongate semicircle, as long as clypeus; jugum with a single, submedian hair on submargin anterior to anteocular seta; surface longitudinally convex, jugum and vertex very closely, rugosely punctured; ocelli large, wider than space separating them from eye; jugum ventrally polished, impunctate; maxillary plate anteriorly to antennal insertion polished, with one or two distinct punctures, posteriorly cribrately punctured. Antennal segments: I, 0.55(0.53–0.60); II, 0.68(0.66–0.70); III, 0.64 (0.60–0.66); IV, 0.94(0.93–0.96); V, 1.14(1.13–1.16). Bucculae higher than labial II, mostly cribrately punctured, abruptly evanescent posteriorly; labium reaching between middle coxae. Labial segments: I, 0.77(0.70–0.80); II, 1.25(1.25–1.26); III, 0.92(0.90–0.96); IV, 0.68 (0.66–0.70).

Pronotum: Width more than twice length, 4.50(4.35–4.70):2.21 (2.13–2.28); anterior margin broadly but shallowly emarginate; lateral margins strongly and broadly emarginate at ends of transverse groove, the carinate margin immediately posterior to emargination appearing reflexed and thickened, posterior fifth of lateral margin obliquely truncated and causing margin to appear angled prebasally; lateral submargin of anterior lobe with four setigerous punctures and prebasal angle laterally on posterior lobe with one setigerous puncture; transverse impression submedian, shallow, irregular, interrupted laterally by oblique fold extending mesally from lateral constriction; entire surface, except curved calli areas, with numerous, close-set punctures.

Scutellum: Longer than wide, 3.55(3.45–3.60):2.74(2.71–2.79); surface shining, with abundant, crowded punctures over all but apex, with a feeble, interrupted suggestion of a median carina; apex slightly inflated, impunctate and usually acute.

Hemelytron: Clavus and corium strongly alutaceous, distinctly duller than pronotum and scutellum; corial areas well defined, disc

and exocorium with scattered weak punctures, former with two complete rows of close-set punctures paralleling claval suture; costa flattened, acute, reflexed on basal two-thirds, with numerous fine punctures and with two coarser setigerous punctures on basal half; costa weakly sinuate posterior to subbasal setigerous puncture; membranal suture bisinuate, lateral angle acute; membrane slightly longer than basal width, surpassing apex of abdomen.

Propleuron: Coarsely and closely punctured at anteroventral angle and in depression, more sparsely and weakly so posterior to depression; prosternal carinae thick, blunt, low.

Mesopleuron: Evaporatorium reaching uninterrupted into posterolateral angle; polished area variously rugose and punctured.

Metapleuron: Evaporatorium occupying mesal four-fifths of segment, lateral margin paralleling side of segment, osteolar canal extending about half way across segment.

Legs: Long, slender.

Sternites: Dull, distinctly alutaceous.

Terminalia: Subgenital plate slightly compressed laterally; with a broad, low, blunt tubercle, medially immediately below apical margin; gonostylus as illustrated (fig. 282).

Length of body: 9.40(9.15–9.57).

Female: Similar to male, except pronotum laterally with only a weak sinuation at ends of transverse impression and no reflexed carinate margin and no oblique furrow projecting mesally on disc.

Head: Length-width ratio, 1.42(1.36–1.49):2.01(1.92–2.11); interocular width, 1.17(1.12–1.23). Antennal segments: I, 0.54(0.50–0.60); II, 0.65(0.63–0.70); III, 0.65(0.64–0.66); IV, 0.92(0.88–0.96); V, 1.14(1.13–1.16). Labial segments: I, 0.79(0.73–0.83); II, 1.24 (1.21–1.26); III, 0.95(0.93–0.96); IV, 0.67(0.63–0.70).

Pronotum: Length-width ratio, 2.25(2.15–2.28):4.67(4.35–4.91).

Scutellum: Length-width ratio, 3.58(3.30–4.01):2.71(2.50–3.00).

Length of body: 9.39(9.00–9.42).

Type data.—Horváth (loc. cit.) gave the type locality as "Peru: Marcapata." The type female (Hung) has the same data.

Specimens studied.—4 males, 9 females.

Peru: Marcapata, 1 female, labeled as "Typus" of *Colobophrys solitaria* Horváth (Hung). Santa Isabel, Department of Cuzco, Valley of Ccosinpata River, Jan. 1, 1952, Nov. 30, 1951, Dec. 3, 25, 1951, F. Woytkowski, 4 males, 8 females (JCL).

Discussion.—The original description of this species served as the genotype of Horváth's new genus *Colobophrys* (see discussion under *Dallasiellus* for reasons for synonymizing the two). The description of the sternites as being smooth is inaccurate, they are really strongly alutaceous.

Dallasiellus (*Dallasiellus*) *triangularis*, new species

Diagnosis.—Among the smaller species of the subgenus this species may be marked by the impunctate scutellar disc and the presence of two complete rows of mesocorial punctures paralleling the claval suture.

Description.—Described from one female. Oval, slightly elongate.

Head: Length more than half width, 0.76:1.33; interocular width, 0.76; anterior outline semicircular, clypeus as long as juga and only slightly narrowed apically; surface polished, impunctate; jugum with two adjacent setigerous punctures next to eye and two more widely spaced ones beyond; ocelli moderately large, separated from eye by about twice a transverse ocellar width; jugum ventrally and apical two-thirds of maxillary plate polished, impunctate. Antennal setments: I, 0.23; II, 0.26; III, 0.36; IV, 0.48; V, 0.60. Bucculae as high as labial II; labium reaching onto mesosternum. Labial segments: I, 0.50; II, 0.83; III, 0.63; 0.40.

Pronotum: Length little more than half width, 1.49:2.73; anterior margin moderately and singly emarginate; lateral margin mostly straight, with six submarginal setigerous punctures; transverse impression postmedian, very weak, marked by medially interrupted, irregular or double row of mostly well-separated punctures; anterior lobe impunctate except for almost straight row immediately behind anterior emargination; posterior lobe impunctate except for very few punctures on disc.

Scutellum: Longer than wide, 1.89:1.56; disc polished, virtually impunctate.

Hemelytron: Clavus and corium polished; clavus with partial longitudinal rows of punctures; mesocorium and exocorium impunctate except at apex and two complete rows paralleling claval suture; costa with two setigerous punctures; membranal suture straight, lateral angle not produced; membrane longer than basal width, reaching tip of abdomen.

Propleuron: Punctate only in depression; prosternal carinae as high as labial II, in profile acutely triangular with apex ventrally.

Mesopleuron: Lateral area impunctate, weakly rugose.

Metapleuron: Peritreme abruptly terminated apically; lateral area polished, with a row of punctures delimiting lateral margin of evaporatorium.

Sternites: Polished, impunctate except laterally near posterior margin of sternite VI.

Legs: Not specially modified.

Length of body: 5.25.

Type data.—Holotype female (BrM), "British Guiana: Essequibo R., Moraballi Creek, 14–viii, 1929, Oxf. Univ. Expedn., B. M. 1929–485."

Discussion.—The peculiar, acutely triangular prosternal carinae appear to be unique within the genus and suggested the trivial name.

Dallasiellus (Dallasiellus) viduus (Stål), new combination

Plate figure 283

Aethus viduus Stål, 1860, p. 13.—Walker, 1867, p. 153.
Macroscytus viduus Stål, 1876, p. 19.
Geotomus viduus Signoret, 1883, p. 45, pl. 3, fig. 154.—Lethierry and Severin, 1893, p. 74.

Diagnosis.—The absence of large punctures on the disc of the scutellum plus the presence of but one submarginal setigerous puncture on each jugum will separate *viduus* from all others in the subgenus.

Description.—From two males and three females.

Male: Elongate-oval.

Head: Length more than half width, 0.64(0.64–0.65):1.04(1.03–1.06); interocular width, 0.64(0.63–0.65); anterior outline subsemicircular, clypeus as long as juga, somewhat narrowed apically; surface slightly convex, impunctate; jugum with one submarginal setigerous puncture immediately anterior to eye; ocelli moderate, separated from eye by space about two times transverse ocellar width; jugum ventrally polished, impunctate; maxillary plate alutaceous and with few punctures on basal third. Antennal segments: I, 0.21(0.20–0.23); II, 0.23(0.20–0.26); III, 0.33(0.32–0.34); IV, 0.55(0.50–0.60); V, 0.55 (0.50–0.60). Bucculae about as high as labial II; labium reaching between middle coxae. Labial segments: I, 0.35(0.34–0.36); II, 0.66(0.66–0.66); III, 0.47(0.44–0.50); IV, 0.33(0.30–0.36).

Pronotum: Length about half width, 1.17(1.17–1.17):2.23(2.18–2.29); anterior margin shallowly, singly emarginate; lateral margin weakly sinuate opposite ends of transverse impression; latter submedian, sharply impressed across full width, marked by entire row of very closely set large punctures; surface with several scattered, minute punctures and a row of coarser ones on anterior lobe paralleling anterior emargination, and several coarse ones discally on posterior lobe.

Scutellum: Longer than wide, 1.52(1.49–1.56):1.26(1.25–1.28); discally polished, with scattered minute punctures but no large ones.

Hemelytron: Clavus and corium feebly alutaceous; clavus with one longitudinal row of coarse punctures; mesocorium obsoletely punctured except for one row of close-set distinct punctures paralleling claval suture; exocorium without distinct punctures; costa without setigerous punctures; membranal suture weakly sinuate, lateral

angle not produced; membrane longer than basal width, surpassing apex of abdomen.

Propleuron: With few distinct punctures in depression; prosternal carinae less than half as high as labial II.

Mesopleuron: Evaporatorium reaching into posterolateral angle, not attaining lateral margin; lateral area impunctate, somewhat depressed apically.

Metapleuron: Lateral margin of evaporatorium virtually straight; lateral area polished, impunctate.

Sternites: Shining, very weakly alutaceous, impunctate.

Legs: Not specially modified.

Terminalia: Genital capsule distinctly punctured laterally, apical margin broadly but shallowly concave; gonostylus as illustrated (fig. 283).

Length of body: 4.33(4.20–4.47).

Female: Similar to male, but side margins of pronotum not sinuate, measurements averaging larger.

Head: Length-width ratio, 0.74(0.71–0.80):1.17(1.13–1.23); interocular width, 0.70(0.70–0.71). Antennal segments: I, 0.26(0.25–0.28); II, 0.27(0.26–0.28); III, 0.37(0.36–0.40); IV, 0.46(0.46–0.46); V, 0.60 (only one specimen with terminal segment). Labial segments: I, 0.37(0.36–0.39); II, 0.69(0.67–0.70); III, 0.56(0.53–0.60); IV, 0.34(0.33–0.36).

Pronotum: Length-width ratio, 1.36(1.31–1.43):2.50(2.43–2.60).

Scutellum: Length-width ratio, 1.69(1.48–1.82):1.56(1.56–1.57).

Length of body: 4.84(4.63–5.09).

Type data.—The locality of Stål's type (Stock) was given as Rio de Janeiro, Brazil.

Specimens studied.—3 males, 3 females.

Brazil: "Brasilia," Coll. Brancsik, 1 female (Hung). Blumenau, Hetschko, 89, 1 male (Wien). Distrito Federal, Carvalho, 1 male (Carv). Rio de Janeiro, 1 male (type, Stock); 1 female (Car). Rio Doce, Minas Gerais, Mrs. Y. Mexia, 1 female (CalAc).

Discussion.—Study of the type left no doubt about the identity of this form.

Subfamily Amnestinae Hart, new status

Amnestini Hart, 1919, p. 204.

Diagnosis.—This subfamily is the only one within the family Cydnidae showing a claval commissure.

Description.—Head: Antennae 4-segmented or 5-segmented.

Scutellum: Short not reaching apices of clavi, latter forming a distinct claval commissure posterior to scutellar apex.

Thoracic pleurae (fig. 113): Posterior margins of all segments well-developed; propleuron with posterior convexity low; mesopleuron with posterior margin touching or overlapping metapleuron for most of width; metapleuron covering posterior coxa, posterior margin expanded as a free, triangular lamella which laterally covers sides of sternites I–III.

Legs: Male with secondary sexual characters in form of strongly modified spines and angulations on femora and/or tibiae; female without secondary sexual modifications of legs; tarsus present on all legs, II subequal in thickness to I and III.

Sternites (fig. 173): Sutures entire, not emarginate laterally; III and IV without trichobothria, V to VII each with a single trichobothrium located posterior to the spiracle.

Terminalia: Male genital capsule opening posteriorly (fig. 179); female plates small, anus completely surrounded by an undivided triangular plate (fig. 185).

Type of subfamily.—Genus *Amnestus* Dallas (1851, p. 126).

Distribution.—From the northern United States south to central Argentina.

Discussion.—The presence of a distinct claval commissure is a very unusual feature in the Pentatomoidea. Usually the scutellum is enlarged so as to surpass the apices of the clavi and prevent their coming together. This condition plus the trichobothrial arrangement, strongly lamellated posterior margin of the metapleuron, and the unusual secondary sexual modifications of the legs of the males set this genus apart from all the other Cydnidae studied and support the elevation of Hart's tribe Amnestini to full subfamily position.

Biologically the Amnestinae are known only from fragmentary notes that have appeared in scattered publications. A generalized life cycle deduced from these notes, data on specimens and personal observations may be outlined here: adults hibernate and so probably lay eggs on again becoming active in spring; both nymphs and adults are root-feeders, with the preferred habitat apparently under moist conditions. This latter is surmised from the fact that the adults, which come freely to lights, are collected most abundantly at lights along bodies of water (i.e., bridge and dock lights, streamside cottages, etc.). This preference for a moist habitat is confirmed by such published statements as "on weeds in slough" (Crevecoeur, 1905) and "on low vegetation along streams" (Blatchley, 1926). The number of generations per year is not indicated by data at hand.

The subfamily contains the single genus, which is treated here.

Genus *Amnestus* Dallas

Amnestus Dallas, 1851, p. 126.
Magoa Stål, 1860, p. 13.
Pachymeroides Signoret, 1880, p. vii. New synonymy.

Diagnosis.—Because this is the only genus in the subfamily, it can be recognized readily by any of the features pointed out above for subfamily recognition.

Description.—Small, 1.6–4.5; subparallel to oval; dorsum much less convex than venter.

Head: Strongly deflexed, wider than long; clypeus as long as or longer than juga, with four apical, marginal pegs, except in *A. sexdentatus*, new species, in which two additional pegs are present; juga with four or five (rarely more) pegs marginally; ocelli well developed, posterior to line connecting hind margins of eyes; primary setigerous punctures usually eight in number (fig. 59)—two near anterior margin of each eye and two on midline of jugum; jugum ventrally and maxillary plate impunctate; antennae usually 5-segmented (described as 4-segmented for *Pachymeroides bolivari* Signoret, and available material of several species show occasional individuals with four segments), II minute, III, IV, and V subequal; bucculae well developed, about one-third length of labial I; labium variable in length, reaching to middle of mesosternum or all the way to sternite III, II compressed, without foliaceous lobe.

Pronotum: Subquadrate to transverse; anterior margin feebly to strongly concave; lateral margins subparallel on basal half converging from base, broadly rounded on apical half, with submarginal row of not more than twelve setigerous punctures; transverse impression postmedian, weak to strong; posterior margin weakly convex, sinuate laterally near umbones; anterior lobe usually distinctly tumid in male, not so in female, variously punctate; posterior lobe punctate, punctures becoming finer posteriorly.

Scutellum: Triangular, wider than long, apex acute, not narrowed; disc shining, coarsely punctate.

Hemelytron: Corial areas well defined; membranal suture deeply emarginate on inner half, lateral angle acute; clavus with three rows of distinct punctures; mesocorium with two rows of punctures paralleling claval suture, variably punctured elsewhere; membrane hyaline to faintly yellowed, comprising a third or more of hemelytral length, surpassing apex of abdomen by one-half its length.

Propleuron: Row of coarse punctures in depression; prosternal carinae well-developed.

Mesopleuron (fig. 113): Evaporatorium occupying entire area; posterior margin entire, straight to moderately prolonged at posterolateral angle.

Metapleuron (fig. 113): Evaporatorium occupying entire area; peritreme transverse, elongate, trough-shaped, slightly curved, reaching two-thirds to three-fourths of way to lateral margin of segment; metasternum carinate, projecting between posterior coxae.

Legs: Moderately long; in male with various secondary sexual characteristics in the form of spines and angles on femora and tibiae (figs. 160–164); in female without such modifications; anterior tibia distinctly compressed, expanded, dorsally with row of seven stout spines set on tubercles.

Sternites: Strongly convex, shining, with abundant long, golden hairs arising from fine punctures.

Nymphs of this genus in the second to fifth instars (first not available for study) can be recognized by the row of stout pegs on the margin of the head, four on the apex of the clypeus—in this respect being like the adults.

Type of genus.—*Cydnus spinifrons* Say (1825, p. 316), monobasic; of *Magoa* Stål, *Magoa cribrata* Stål (1860, p. 14), designated by Van Duzee (1917, p. 23); of *Pachymeroides* Signoret, *Pachymeroides bolivari* Signoret (1880, p. vii), monobasic.

Distribution.—*Amnestus* is a New World[10] genus known to range from Maine and Ontario west to Colorado, thence south through Central America and the West Indies into South America as far as Buenos Aires, Argentina.

Discussion.—The synonymy of *Magoa* with *Amnestus* has long been accepted and is supported by present findings, which included study of the types of all the species that Stål originally included in *Magoa*.

The synonymy of *Pachymeroides* with *Amnestus* is here proposed because of the strong features which ally the two and the very weak separating characters. For separation Signoret relied most heavily on the condition of the 4-segmented antennae as contrasted to the 5-segmented condition in typical *Amnestus*. While such a reduction of number of antennal segments is not common in *Amnestus*, at least some species do show it in an occasional specimen. Therefore, it certainly cannot be considered a reliable generic separation. A second structural difference between these two nominal genera was the "absence" of evaporatoria in *Pachymeroides*. But even this may be looked upon as a matter of interpretation as greasy specimens frequently have shiny mesothoracic and metathoracic pleurae and superficially appear to be without the "plaques mates." The generic separation of *bolivari* from all the other species of *Amnestus* does not appear sound when these weak separations used by Signoret are com-

[10] One specimen (in MCZ) of *pusio* (Stål) labeled "Madagascar" must be a case of mislabeling, or at most a stray specimen carried into that part of the world by the agency of man.

pared with such allying features as presence of hemelytral suture, marginal pegs on the head, secondary sexual differences, general punctation, small size, and general shape.

Although this genus appears to be readily separable into species units, the problems of correctly associating older names with them has been vexing. The chief reason for this appears to lie in the fact that the small size of the specimens has deterred some authors from making critical enough studies of specimens to locate the real diagnostic features. Consequently, without a personal study of the types, the author feels that this must be considered the most tentative part of the present work. Perhaps with the points established here the author or other workers may have opportunity to examine the types and be able to straighten out the nomenclature.

Until corrected by Hart (1919), workers generally had the sexes of this genus confused. They described the females as having prominent spines on the ventral surface of the femur, whereas these secondary sexual modifications in reality belong to the males. The male also generally has the anterior lobe of the pronotum more tumid than do the females.

From specimens available, males of some species of *Amnestus* were arranged according to the secondary sexual characteristics of the legs, as follows:

1a. Anterior tibia distinctly angled (sometimes obtusely so) or spined midventrally (figs. 131, 132).
  2a. Anterior tibia ventrally with spine at basal fourth (fig. 132).
    3a. Subapical ventral spine of posterior femur a third or more of tibial length (fig. 164) . . . . **pusillus**
    3b. Subapical ventral spine of posterior femur shorter than vertical height of femur . . . . **basidentatus**
  2b. Anterior tibia without subbasal spine ventrally.
    4a. Posterior femur dorsally angulated subapically (fig. 162).
lateralis, pusio, radialis
    4b. Posterior femur dorsally without subapical angulation.
      5a. Medioventral spine of anterior femur conical, with a prominent lateral spine near its midlength (i.e., very unequally bifurcate) (fig. 131) . . . . **spinifrons**
      5b. Medioventral spine of anterior femur simple or feebly, equally bifurcate . . . . **subferrugineus**
1b. Anterior tibia neither spined nor distinctly angled midventrally.
  6a. Anterior femur with midventral spine simple . **diminuatus, explanatus**
  6b. Anterior femur with midventral spine furcate.
    7a. Subapical spine of posterior femur flattened, bifid.
championi, cribratus, forreri
    7b. Posterior femur with ventral spine not bifid, either spine-, needle- or blade-like.
brunneus, foveatus, lautipennis, pallidus, trimaculatus, uhleri

While the above arrangement may be of interest and aid in placing male specimens, a key which will enable one to determine both sexes to species is more valuable. Such a key is given here:

Key to species of *Amnestus*

1. Jugum with five (occasionally more) marginal pegs (fig. 61)[11] 2
   Jugum with four marginal pegs (fig. 64) 15
2. Clypeus surpassing juga by a length equal to or greater than its own width; prosternal carinae longer than high, ventral margin feebly convex. **uhleri** Distant (p. 663)
   Clypeus not or only slightly surpassing (much less than its own width) juga 3
3. Labium long, reaching or surpassing base of abdomen. **spinifrons** (Say) (p. 658)
   Labium short, not surpassing middle coxae 4
4. Exocorium with costal half hyaline, impunctate or very feebly punctate; prosternal carinae (in profile) concave ventrally (fig. 40). **trimaculatus,** new species (p. 661)
   Exocorium uniformly punctate across full width 5
5. Pronotal umbones distinctly, closely punctate over full surface 6
   Pronotal umbones polished, mostly impunctate 8
6. Prosternal carinae (in profile) distinctly concave ventrally (as in fig. 40); pronotum unicolorous blackish brown 7
   Prosternal carinae much longer than high, not or very feebly concave ventrally; posterior pronotal lobe yellow like coria, distinctly paler than brown anterior lobe . . . . **forreri** Distant (p. 645)
7. Anteocular part of juga coarsely sculptured to apex. **cribratus** (Stål) (p. 642)
   Anteocular part of juga polished, virtually without sculpturing. **championi** Distant (p. 640)
8. Clypeus with six apical pegs, the usual marginal four plus two on midline, one above and one below margin; posterior pronotal lobe distinctly lighter than anterior lobe . . . . **sexdentatus,** new species (p. 657)
   Clypeus with not more than four apical pegs 9
9. Prosternal carinae (in profile) lobulate, vertical anteriorly (fig. 38). **subferrugineus** (Westwood) (p. 660)
   Prosternal carinae rounded or longer than high, not vertical anteriorly . . 10
10. Prosternal carinae about twice as high as labial II, semicircular, with prominent, deep fovea laterally near base (fig. 39). **foveatus,** new species (p. 647)
    Prosternal carinae distinctly lower than labial II, without fovea 11
11. Clavus and usually coria distinctly paler than scutellum and most or all of pronotum 12
    Clavus and corium concolorous with pronotum and scutellum. **pallidus** Zimmer (p. 650)

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[11] This choice will also lead to Distant's four species—*bergrothi, dallasi, signoreti,* and *stali* (see p. 664 for further comments on these forms).

12. Anterior pronotal lobe laterally with two to four irregular rows of close coarse punctures similar in size or larger than those of transverse impression; mesocorium with large impunctate area on disc. 13
    Anterior pronotal lobe with lateral punctures finer than those of transverse impression; mesocorium sparsely but uniformly punctate on disc.
    lateralis Signoret (p. 648)
13. Corium with longitudinal brownish line along radial vein extending to costa along apical margin; umbone distinctly paler than remainder of pronotal disc . . . . **radialis,** new species (p. 656)
    Corium without brownish line along radial vein; umbone concolorous with remainder of pronotal disc 14
14. Lateral pronotal margins slightly but distinctly concave at basal fourth; corium becoming fuscous on apical third or more.
    brunneus Signoret (p. 639)
    Lateral pronotal margin straight on basal half; corium uniformly yellowish.
    lautipennis (Stål) (p. 649)
15. Pronotal umbones prominently, closely punctate over surface.
    bolivari (Signoret) (p. 637)
    Pronotal umbones in great part not punctate 16
16. Male: Subapical ventral spine of posterior femur more than one-third length of tibia (fig. 164). Female: Last sternite with medially flattened, glabrous area delimited laterally by partial or complete, obtuse, longitudinal carinae (fig. 184) . . . . **pusillus** Uhler (p. 652)
    Male: Subapical ventral spine of posterior femur shorter than vertical height of femur. Female: Last sternite without flattened glabrous area, or if present, not so delimited laterally 17
17. Middle third of costa narrowly expanded, reflexed, forming shallow trough nearly as wide as middle tibia . . . . **explanatus,** new species (p. 649)
    Corium convex to margin, neither explanate nor reflexed in middle third . 18
18. Clypeus convex, with prominent, transverse rugae; coria with obscure fuscous cloud across middle and at apex . . **diminuatus** Barber (p. 643)
    Clypeus not transversely rugose; coria unicolorous hyaline-yellow . . . 19
19. Male: Anterior tibia with distinct, subbasal spine ventrally (fig. 132).
    basidentatus, new species (p. 634)
    Male: Anterior tibia without subbasal spine ventrally . . **pusio** (Stål) (p. 654)

Amnestus basidentatus, new species

Plate figures 132, 285

Diagnosis.—The males of this species can be separated from males of all others in the genus by the distinct subbasal spine on the ventral margin coupled with short, ventral, subapical spine on posterior tibia. The females of *basidentatus* and *pusio* will run easily to the last couplet of the key, but the author is unable to separate that sex of these two species by a practical key character.

Description.—Color: Light brownish yellow, coria, legs, and labium slightly but distinctly paler.

Male.—Elongate, parallel-sided.

Head: Length almost three-fourths width, 0.37(0.37–0.39):0.50 (0.49–0.52); interocular width, 0.29(0.29–0.30); clypeus slightly longer than juga; latter with four marginal pegs; surface, except

clypeus, with coarse, crowded punctures. Antennal segments: I, 0.11(0.10–0.12); II, 0.02(0.02–0.03); III, 0.19(0.17–0.20); IV, 0.18(0.16–0.20); V, 0.20(0.19–0.22). Labium reaching between middle coxae. Labial segments: I, 0.16(0.14–0.18); II, 0.21(0.20–0.23); III, 0.27(0.26–0.27); IV, 0.21(0.20–0.23).

Pronotum: Length less than two-thirds width, 0.68(0.64–0.71):1.08 (1.05–1.13); anterior margin virtually truncate, not concave; lateral margin weakly sinuate on basal third; transverse impression moderate, punctate; anterior lobe weakly tumid, with prominent punctures laterally, subapically, along midline and scattered over disc of calli; posterior lobe, except umbones, with close-set, moderate punctures.

Scutellum: Length-width ratio, 0.44(0.43–0.46):0.51(0.49–0.54).

Hemelytron: Mesocorium with few discal punctures; exocorium abundantly punctate across full width.

Propleuron: Prosternal carinae lower than labial II, subrectangular.

Legs: Anterior femur ventrally near basal third with strongly oblique, stout spine slightly emarginate at apex; anterior tibia ventrally with strong, subbasal spine in addition to median angulation (fig. 132); posterior femur with subapical oblique spine simple, about half as high as femur.

Terminalia: Gonostylus as illustrated (fig. 285).

Length of body: 1.94(1.93–1.96).

Female: Similar to male, without secondary sexual modifications.

Head: Length-width ratio, 0.38(0.35–0.40):0.51(0.49–0.54); interocular width, 0.30(0.28–0.31). Antennal segments: I, 0.11(0.10–0.13); II, 0.02(0.02–0.03); III, 0.17(0.16–0.18); IV, 0.17(0.16–0.20); V, 0.19(0.16–0.22). Labial segments: I, 0.16(0.16–0.17); II, 0.23(0.21–0.25); III, 0.29(0.27–0.30); IV, 0.20(0.20–0.22).

Pronotum: Length-width ratio, 0.61(0.56–0.64):1.05(0.98–1.10).

Scutellum: Length-width ratio, 0.44(0.42–0.46):0.49(0.46–0.53).

Length of body: 1.87(1.75–1.95).

Type data.—Holotype male (USNM 64408) and allotype female (USNM) both labeled "Hamilton County, Tenn., 8-13-40, W. F. Turner, at light." Paratypes as follows:

United States: *Alabama:* No exact locality, 1 female (labeled "Ala. 2286, *Amnestus pusillus*") (USNM). Auburn, Lee Co., June 30, 1939, F. S. Barkalow, 7 males, 6 females (one labeled *Amnestus pusio*) (MMZ). Clay Co., H. H. Smith, 1 female (USNM). Burnsville, July 20, 1930, P. W. Oman, L. D. Tuthill, 7 males, 7 females (KU, RCF). Decatur, July 6, 1939, D. E. Hardy, P. B. Lawson, 2 males, 1 female (KU). Marion Junction, July 16, 1930, P. W. Oman, L. D. Tuthill, 2 males, 1 female (KU). Tuskegee, July 22, 1930, R. H. Beamer, L. D. Tuthill, 1 male, 1 female (KU). *Arkansas:* Berryville, July 4, 1934, R. H. Beamer, 1 male (KU). Hope, Oct. 3, 1925, L. Knobel, 3 females (USNM). Howard Co., Feb. 2, 1938, 2 males, 1 female; May 13, 1938, 1 female; Sept. 24, 1937, 5 males, 3 females, all W. F. Turner (USNM). Pike Co., June 10, 1936, in soil, 1 male, 1 female (USNM). Polk Co., Aug. 21, 1928, R. H. Beamer, 1 male,

1 female (KU). *District of Columbia:* Washington, 1 female (USNM). *Florida:* Branford, Aug. 4, 1939, R. H. Beamer, 1 male, 2 females (KU). One-half mile west of Child's Crossing, Highlands Co., Aug. 11, 1928, Hubbell and Friauf, 3 males, 5 females (one labeled *Amnestus pusio*) (MMZ). Coconut Grove, March, G. Fairchild, 7 males, 5 females (MCZ, RCF). Crescent City, June, 1938, C. T. Brues, 1 female (MCZ). Deerfield, July 26, 1948, E. L. Todd, 15 males, 29 females (KU, RCF). Dunnellon, July 12, 1939, P. B. Lawson, 1 male, 1 female (KU). Everglades, Apr. 11, 1912, W. T. Davis, 1 female (USNM). Fort Myers, Aug. 11, 1930, J. Nottingham, 1 female (KU). Fort Pierce, Aug. 7, 1930, P. W. Oman, 2 males (KU). Fort Lauderdale, May 25, 1928, D. M. Bates, 6 males, 9 females (labeled *Amnestus pusio*) (MMZ, RCF). Gainesville, May 25, 1934, T. H. Hubbell, 1 female (labeled *Amnestus pusio*) (MMZ); May 28, 1922, 1 female (RFH); Oct. 21, 1923, T. H. Hubbell, at light, 1 female (RFH). Hilliard, Aug. 6, 1939, R. H. Beamer, 1 male (KU), Aug. 31, 1930, J. O. Nottingham, 1 male (KU). Hillsborough River State Park, Hillsborough Co., Aug. 18, 1928, Hubbell-Friauf, 2 males, 1 female (MMZ). Homestead, Sept. 25, 1948, R. H. Beamer, 1 female (KU). Indian River, Apr. 7, 1930, J. R. Barass, Florida Fruit Fly Trap Survey, La Belle, July 16, 1939, D. E. Hardy, 1 male, 5 females (KU). Lacoochee, July 7, 1948, E. L. Todd, 4 males, 3 females (KU); Aug. 9, 1939, R. H. Beamer, 1 male (KU). Lakeland, Apr. 3, May 28, June 5, 10, 20, July 11, 20, 25, Aug. 7, Oct. 2, 7, Nov. 14, various years and collectors, 12 males, 16 females (RFH, MMZ). Lake Placid, July 10, 13, 16, 1948, N. W. Crosder, 31 males, 35 females (KU, RCF). 7 miles northeast of Leesburg, Lake Co., Aug. 27, 1938, Hubbell-Friauf, 3 females (labeled *Amnestus pusio*) (MMZ). Morrison Field, Jan. 28, 1943, D. E. Hardy, 2 males (KU). Okeechobee, Mar. 3, 1939, F. E. Lutz, 1 male (AmM). Old Town, July 11, 1939, R. H. Beamer, 1 male (KU). Orlando, July 1927, O. C. McBride, 3 males, 1 female (USNM). Paradise Key, Feb. 29, 1919, H. G. Barber, 1 female (USNM). Plant City, Aug. 15, 1930, J. O. Nottingham, L. D. Tuthill, 2 males, 18 females (KU). Port Mayaca, Mar. 13, 1939, F. E. Lutz, 1 female (labeled *Amnestus pusio*) (AmM). Royal Palm State Park, July 22, 1948, E. L. Todd, 8 males, 11 females (KU, RCF). Sanford, July 31, 1933, C. O. Bare, 7 males, 5 females (KU). 1.7 miles northeast of Satsuma, Putnam Co., July 30, 1938, Hubbell-Friauf, 4 females (some labeled *Amnestus pusio*) (MMZ). Sebring, Mar. 7, 1939, F. E. Lutz, 2 females (AmM); Aug. 5, 1930, R. H. Beamer, 1 female (KU); December, Aug. 30, C. T. Parsons, 3 males, 2 females (MCZ). Vero Beach, Feb. 14, swept from St. Augustine grass, Webster No. 9458, 1 male (USNM); Feb. 18, 1914, swept from Bermuda grass, G. G. Ainslie, 1 male (UNSM). *Georgia:* Crawford Co., Oct. 10, 1938, W. F. Turner, 1 male, 2 females (USNM). Demorest, Aug. 19, 1939, Valentine, 1 male, 4 females (USNM); Sept. 9, 1939, J. M. Valentine, 5 males, 9 females (1 labeled *Amnestus* n. sp. by H. G. Barber) (USNM). Okefenokee Swamp, July 27, 1939, E. G. Wegenek, 1 female (KU); July 30, 1934, M. E. Griffin, 1 male, 29 females (KU); Aug. 3, 1934, M. E. Griffin, R. H. Beamer, P. A. McKinstry, 8 males, 4 females (KU). Peach Co., Jan. 29, Feb. 13, Apr. 3, 22, June 17, Sept. 17, Oct. 11, 12, 13, Dec. 5, various years, W. F. Turner, 21 males, 32 females (USNM). Perry, Aug. 12, 1939, W. F. Turner, 1 female (USNM). Prattsburg, July 25, 1930, L. D. Tuthill, 1 male, 3 females (KU). Tifton, Aug. 11, 1939, D. E. Hardy, 1 male, 4 females (KU). Upson Co., Nov. 25, 1937, W. F. Turner, 2 females (USNM). *Louisiana:* Bossier Parish, Feb. 2, May 10, 1939, W. F. Turner, 2 males (USNM). Covington, June 23, 1948, E. L. Todd, 7 males, 10 females (KU). Denham Springs, June 20, 1948, E. L. Todd, 3 females (KU). Hammond, June 22, 1948, E. L. Todd, 2 males, 1 females (KU). Madison Parish, July 7,

1930, R. W. Bunn, 1 male, 1 female (KU). Natchitoches Parish, Aug. 16, 1938, L. D. Beamer, (KU). Shreveport, July 3, 1895, F. W. Mally, 1 female (USNM). *Maryland:* Berlin, F. C. Bishop, mosquito trap, 1 male (USNM). College Park, Aug. 10, 1932, F. C. Bishop, mosquito trap, 1 male (USNM). Gibson Island, July 28, 31, 1933, F. C. Bishop, mosquito trap, 2 females (USNM). Plummers Island, Oct. 5, 1913, W. L. McAtee, 1 female (USNM). Sparrow Point, July 5, Aug. 6, 8, 1933, F. C. Bishop, 2 males, 4 females (one male labeled *Amnestus pusio*) (USNM). *Mississippi:* Fulton, July 14, 1930, R. H. Beamer, 2 males (KU). Hamilton, July 15, 1930, L. D. Tuthill, 2 females (KU). Horn Island, July 12, 1944, 1 male (MassU). Ireland, July 3, 1934, M. E. Griffin, 3 females (KU). Madison Co., Sept. 8, 1937, W. F. Turner, 1 female (USNM). Meridian, July 17, 1930, R. H. Beamer, 1 male, 1 female (KU). Shuquaalak, July 16, 1930, P. W. Oman, 1 female (KU). *Missouri:* Scott Co., Nov. 9, 1937, W. F. Turner, soil, 2 males (USNM). *New York:* Indian Lake, Sabael, Aug. 22, 1921, 1 male, 1 female (USNM). *North Carolina:* No exact locality, July 10, 1929, W. F. Turner, 1 female (USNM). *Pennsylvania:* No exact locality ("Penn. Eastern"), June 30, 1933, 1 male (MCZ). *South Carolina:* Saluda Co., Mar. 2, 1938, Dec. 3, 1937, W. F. Turner, 3 males, 6 females (KU, USNM). *Tennessee:* Chattanooga, Aug. 11, 1941, Turner, at light, 1 female (USNM); Hamilton Co., Mar. 26, Apr. 16, 18, June 22, 24, July 1, Aug. 2, 4, 13, 16, 20, 21, 23, 28, Oct. 3, 22, Nov. 3, various years, all W. F. Turner, 62 males, 90 females (RCF, USNM). *Texas:* Bay City, May 4, 1953, R. H. Beamer, 1 male (KU). Bexar [County?] July 16, 1937, W. F. Turner, 1 female (USNM). Brazoria Co., Aug. 10, 12, 1928, R. H. Beamer, 2 females (KU). Tyler, Feb. 15, 1939, 1 male (USNM); Sept. 1, 1937, L. D. Christenson, soil in peach orchard, 1 male (USNM); Oct. 24, 1939, 1 male (USNM); Nov. 23, 1939, 1 male, 1 female (USNM). *Virginia:* Bedford, June 4, 1904, 1 male, 2 females (KU, USNM). Nelson, July 20, 1926, W. Robinson, 3 females (USNM); July 23, 26, 1924, W. Robinson, 3 females (USNM). Norfolk, Mar. 21, 1938, L. D. Anderson, 1 male (KU); Aug. 11, 1934, P. McKinstry, 1 male (KU). Warrenton, June 5, 1928, L. C. Woodruff, 1 female (KU).

CUBA: Cayamas, Mar. 16, E. A. Schwarz, 1 male (USNM).

DISCUSSION.—This species ranges from New York south to Florida and Cuba, and west to Missouri and Texas. Since the females of *basidentatus* and *pusio* are not yet readily separated they are not used to delimit the range of the two forms. Records of them from within the established ranges, however, are listed among the specimens studied.

This species has been masquerading under the names *pusio* and *pusillus*, thus making published records even less reliable than they would have been in the former confused state of the Cydnidae.

Amnestus bolivari (Signoret), new combination

Pachymeroides bolivari Signoret, 1880, p. vii; 1883, p. 366, pl. 10, fig. 191.—Lethierry and Severin, 1893, p. 75.

DIAGNOSIS.—The combination of the four marginal pegs on each jugum coupled with the closely and abundantly punctate umbones will permit ready recognition of this species.

DESCRIPTION.—In the absence of specimens for study and the

current unavailability of the original description, Signoret's (1883) characterization of *bolivari* is quoted here:

Coca (Equateur).—Long. 3½ mill., larg. 1¾ mill. (Mus. roy. de Madrid.)

D'un brun ferrugineux, en ovale allongé, aplati, dentelé au bord de la tête, très largement ponctué en dessus, presque rugneux.

Tête très petite, foliacée sur le bord, le lobe médian dépassant un peu les latéraux, sur celui-là quatre dents en forme d'épines et sur ceux-ci quatre sur chaque. Vertex fortement ponctué, lisse vers le sommet, surtout sur le médian. Yeux forts, presque pédonculés. Ocelles très forts. Antennes de quatre articles, dont le second deux fois plus long que le troisième, le quatrième un peu plus long que le précédent et plus grêle. Prothorax avec un large rebord foliacé, ponctué, crénelé et cilié; disque très ponctué, excepté quatre espaces lisses sur le disque antérieur. Écusson court, les bords latéraux presque égaux à la base, l'extrémité très acuminée, très ponctué sur tout le disque. Élytres longues, la membrane blanche sans nervures visibles, dépassant de moitié l'abdomen, la portion du cubitus offrant trois lignes complètes de points, la corie irrégulièrement ponctuée le long des bords, mais présentant trois séries longitudinales, dont une très rapprochée de la suture cubitale, les deux autres séparées sur le disque avec des espaces lisses entre elles, le sommet de la corie fortement sineux, la côte marginale crénelée, ciliée à la base, puis lisse à partir du millieu. Abdomen lisse, crénelé au sommet des segments, faiblement marqué de points ciliés sur le disque, les points plus nombreux sur les côtés. Mésosternum lisse, fortement impressionné de larges points vers la hanche; métasternum avec un canal ostiolaire large, épais, sillonné, et présentant en arrière une longue ouverture dans la forme de celle des Séhirides; le reste lisse, ainsi que le post-métasternum. Pattes ciliées et spinuleuses, les cuisses antérieures ♀ offrant vers le tiers supérieur une forte épine bifide, et, après, deux ou trois plus externe cinq ou six épines, vers le sommet quatre. Tarses courts, le troisième article le double plus long que les précédents et égalant les deux articles basilaires réunis. Cuisses intermédiaires ne présentant que des cils.

Type data.—The type, from "Coca (Equateur)," has not yet been located.

Discussion.—Although the type of *bolivari* has not yet been positively located, there is in the Signoret collection (Wien), a card point with two legs of a male glued to it. The labels on it show that the specimen was from Ecuador and had been determined by Signoret as *Pachymeroides bolivari*. Although no type label is present, this specimen may well be the type. But Signoret's work specimens do not always agree with the illustrations in his "Revision." In this case, the remaining front leg does not show the two ventral tubercles between the middle and subapical spines. However, two features illustrated by Signoret (1883, fig. 191)—the four marginal pegs on each jugum and the closely punctate pronotal umbones—allow no choice except to consider this a valid species as characterized here.

Specimens studied.—One broken male consisting of one anterior leg and one middle leg (Wien), from Ecuador.

Amnestus brunneus Signoret

PLATE FIGURE 287

Amnestus brunneus Signoret, 1883, p. 370, pl. 10, fig. 194.—Uhler, 1886, p. 3.—Lethierry and Severin, 1893, p. 75.

DIAGNOSIS.—Among the species with five marginal pegs on each jugum and the low, rounded prosternal carinae which are not higher than labial II, *brunneus* may be characterized by the short clypeus which only very slightly surpasses apices of juga and by the strongly contrasting yellowish (in large part) coria with the dark brown or brownish black pronotum and scutellum.

DESCRIPTION.—Based on one male and one female compared with the type.

Color: Head, pronotum and scutellum dark brown, contrasting strongly with yellowish hyaline clavus and corium, latter with broad apical margin weakly to distinctly fuscous; underside brownish, legs tannish brown with apices of femora and tarsi yellow.

MALE: Elongate-oval, slightly widest behind middle.

Head: Length more than three-fourths width, 0.40:0.52; interocular width, 0.32; anterior outline elongate, clypeus very slightly surpassing apices of juga; surface shining, strongly punctate on bases of juga and on interocular area; jugum with five marginal pegs. Antennal segments: I, 0.11; II, 0.03; III, 0.23; IV and V missing. Labium reaching between middle coxae. Labial segments: I, 0.16; II, 0.22; III, 0.29; IV, 0.20.

Pronotum: Length two-thirds width, 0.81:1.21; anterior margin shallowly emarginate; lateral margin very shallowly emarginate subbasally; transverse impression moderately indicated, marked by row of coarser punctures; anterior lobe weakly tumid, with two more or less complete rows of coarse punctures subapically and laterally, calli shining with few scattered, minute punctures, midline with double row of fine punctures; posterior lobe, except umbones which project to anterior lobe as a ridge, with numerous separated punctures becoming finer posteriorly.

Scutellum: Wider than long, 0.60:0.50.

Hemelytron: With few punctures near apex; exocorium closely and uniformly punctured over entire area.

Propleuron: Prosternal carinae not higher than labial II, broadly rounded in profile.

Legs: Anterior femur with premedian, oblique, stout spine unequally furcate; anterior tibia vaguely, obtusely angled ventrally near midlength; posterior femur ventrally with slender, oblique, subapical spine about half as long as femoral height, dorsally with distinct, subapical angulation.

Terminalia: Gonostylus as illustrated (fig. 287).

Length of body: 2.08.

Female: Similar to male, but without secondary sexual modifications.

Head: Length-width ratio, 0.40:0.50; interocular width, 0.32. Antennal segments: I, 0.13; II, 0.04; III, 0.22; IV, and V missing. Labial segments: I, 0.16; II, 0.23; III, 0.29; IV, 0.20.

Pronotum: Length-width ratio, 0.84:1.22.

Scutellum: Length-width ratio, 0.44:0.56.

Length of body: 2.10.

Type data.—None of the three specimens from the Signoret collection (Wien) bears a type designation, but all are from Mexico and bear labels indicating that Signoret had determined them as this species. Thus, these may be accepted as the type series because Signoret listed the original locality simply as "Mexique." The specimen labeled "Bilimek" is here designated lectotype.

Specimens studied.—3 males, 2 females:

Mexico: No exact locality, 1 male, 1 female (Wien). Coricavaca, 1871, Bilimek, 1 male (Wien). San Luis Potosí, July 17, 1947, intercepted on orchids at Laredo, Tex., 47–9428, 1 female (USNM). Oaxaca, May 13, 1938, R. Greenfield, 1 male (USNM).

Discussion.—Several discrepancies between Signoret's specimens of *brunneus* and his published work may be pointed out here: clypeus actually slightly surpasses juga; anterior pronotal lobe has median punctures concentrated in a broad, median line, not in two rows; there are no setigerous punctures across calli; pronotal transverse impression more nearly median than shown; metapleuron not showing the complicated "fold" pattern depicted anterior and lateral to the peritreme; and mesocorium has several obsolete but noticeable punctures apically.

Amnestus championi Distant

Plate figure 286

Amnestus championi Distant, 1893, p. 453.

Diagnosis.—Among those species of the genus with five pegs on the margin of each jugum, this one may be recognized by the closely punctate umbones and the subbasal fuscous spot on the corium.

Description.—Color: Head, pronotum, and scutellum dark brown to black, shining, somewhat paler along free edges of head and pronotum; clavus and coria translucent yellow, latter with distinct fuscous spot near base and usually faint clouding along apical margin;

underside reddish brown to brown, antennae, labium, and legs distinctly paler.

Male: Oval, widest across anterior pronotal lobe.

Head: Length more than four-fifths width, 0.50(0.39–0.53):0.59 (0.56–0.62); interocular width, 0.32(0.30–0.34); clypeus distinctly surpassing juga, outline of head notched at their juncture; juga with five marginal pegs; surface coarsely punctate between and posterior to eyes. Antennal segments: I, 0.12(0.11–0.13); II, 0.03(0.03–0.05); III, 0.25(0.24–0.26); IV and V missing on all specimens. Labium attaining middle coxae. Labial segments: I, 0.21(0.20–0.23); II, 0.28(0.26–0.31); III, 0.28(0.26–0.31); IV, 0.23(0.20–0.26).

Pronotum: Length more than two-thirds width, 0.98(0.63–1.06): 1.41(1.35–1.50); anterior margin moderately concave, deeply cupped behind eyes; lateral margin slightly concave and weakly converging on basal half; transverse impression moderately impressed, punctate; anterior lobe, including most of disc of calli, with crowded, prominent punctures; posterior lobe, including umbones, densely punctate.

Scutellum: Length-width ratio, 0.52(0.50–0.54):0.66(0.63–0.72).

Hemelytron: Mesocorium with few scattered punctures discally; exocorium abundantly punctate across full width.

Propleuron: Prosternal carinae about twice as high as labial II, anterior margin vertical, ventral margin concave.

Legs: Anterior femur with medioventral spine strongly oblique, unequally furcate, with small, subapical tubercle on posteroventral margin; anterior tibia without median angulation ventrally; posterior femur with ventral, subapical spine very short, oblique, not or weakly bifid.

Terminalia: Gonostylus as illustrated (fig. 286).

Length of body: 2.27(2.15–2.38).

Female: Similar to male, lacking secondary sexual modifications and widest across humeri.

Head: Length-width ratio, 0.48(0.46–0.52):0.58(0.53–0.61); interocular width, 0.30(0.30–0.32). Antennal segments: I, 0.11(0.10–0.12); II, 0.03(0.02–0.03); III, 0.24(0.20–0.29); IV, 0.22(0.18–0.27); V, 0.23(0.21–0.26). Labial segments: I, 0.22(0.21–0.24); II, 0.26 (0.22–0.30); III, 0.27(0.26–0.29); IV, 0.22(0.20–0.24).

Pronotum: Length-width ratio, 0.81(0.70–0.91):1.36(1.20–1.52).

Scutellum: Length-width ratio, 0.51(0.46–0.56):0.62(0.53–0.71).

Length of body: 2.12(1.89–2.30).

Type data.—Distant's single specimen, a female (BrM), is from "Guatemala, Zapote."

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Specimens studied.—7 males, 6 females.

Panama: Barro Colorado Island, Canal Zone, Jan.-Mar., 1944, Zetek-5122, 2 males, 1 female (USNM); July-Aug. 1942, Jas. Zetek, No. 4985, 4 males, 3 females (RCF, USNM); Oct.-Nov. 1941, Jas. Zetek, No. 4915, 1 male, 2 females (USNM).

Discussion.—The present interpretation of *championi* is based on the following evidence: (1) It is the only Central American species described with a subbasal fuscous spot on the corium; (2) the pronotum and scutellum were described as thickly and coarsely punctate; (3) the "frontal [clypeal] spines" were described as "much more developed than lateral ones"; and (4) Dr. China has supplied the information that the exocoria are fully punctate across their width.

Amnestus cribratus (Stål)

Plate figure 289

Magoa cribrata Stål, 1860, p. 14.
Amnestus cribratus Walker, 1867, p. 170.—Stål, 1876, p. 21.—Signoret, 1883, p. 370, pl. 10, fig. 195.—Lethierry and Severin, 1893, p. 75.

Diagnosis.—The punctate umbones coupled with the color pattern (coria mostly yellowish hyaline, contrasting strongly with dark brown head, pronotum and scutellum) will mark this species from its congenors.

Description.—From two males and two females. Color: Head, pronotum, scutellum, and vague band across basal fourth of corium blackish brown, corium mostly translucent yellow; venter reddish brown, legs paler.

Male: Oval, sides parallel.

Head: Length about four-fifths width, 0.49(0.48–0.50):0.61(0.58–0.64); interocular width, 0.34(0.33–0.36); clypeus surpassing truncated juga by less than own width, with four apical pegs; juga with five marginal pegs; surface cribrately punctate except on clypeus and base. Antennal segments: I, 0.13(0.13–0.13); II, 0.03(0.03–0.04); III, 0.26(0.26–0.26); IV, 0.23(0.23–0.23); V, 0.26(0.26–0.26). Labium reaching between middle coxae. Labial segments: I, 0.26(0.26–0.26); II, 0.30(0.30–0.30); III, 0.31(0.31–0.32); IV, 0.23(0.22–0.24).

Pronotum: Length almost two-thirds width, 0.96(0.92–1.00): 1.54(1.45–1.63); anterior margin moderately concave, cupped behind eyes; transverse impression distinct, marked by row of coarse punctures; anterior lobe moderately tumid, strongly and closely punctate laterally, apically, medially, posteriorly and on most of calli; posterior lobe, including umbones, with crowded, strong punctures.

Scutellum: Length more than three-fourths width, 0.58(0.56–0.61):0.75(0.70–0.80).

Hemelytron: Mesocorium hyaline with few punctures near apex; exocorium uniformly and closely punctate across entire width.

Propleuron: Prosternal carinae anteriorly higher than labial II, bluntly triangular with apex ventrally.

Legs: Anterior tibia with oblique, premedian, stout spine unequally furcate, with small, subapical spine on posterior margin; anterior tibia without median angulation ventrally; posterior femur with strong, subapical angulation dorsally, and ventrally with strong, bifid, subapical tooth.

Terminalia: Gonostylus as illustrated (fig. 289).

Length of body: 2.52(2.42–2.63).

Female: Similar to male, but without the secondary sexual modifications.

Head: Length-width ratio, 0.49(0.47–0.51):0.63(0.63–0.63); interocular width, 0.34 (0.34–0.35). Antennal segments: I, 0.13(0.13–0.13); II, 0.03(0.03–0.03); III, 0.25(0.24–0.26); IV, 0.23(0.23–0.23); V, 0.25(0.25–0.26). Labial segments: I, 0.24(0.23–0.25); II, 0.28(0.28–0.28); III, 0.32(0.31–0.33); IV, 0.23(0.23–0.23).

Pronotum: Length-width ratio, 0.94(0.88–1.00):1.58(1.53–1.64).

Scutellum: Length-width ratio, 0.63(0.60–0.66):0.78(0.70–0.86).

Length of body: 2.52(2.44–2.60):

Type data: Stål described his species from a female (Stock) from "Rio Janeiro."

Specimens studied: 3 males, 3 females.

Brazil: [Rio de Janeiro], F. Sahlb., "Typus," 1 female (Stock). Nova Teutonia, Santa Catarina, Jan. 4, 1953, May 8, 1952, Sept. 22, 1929, 1952, F. Plaumann, 3 males, 2 females (JCL).

Discussion: Van Duzee (1917, p. 23) designated this species as the genotype of Stål's *Magoa*.

Amnestus diminuatus Barber

Amnestus diminuatus Barber, 1939, p. 274, fig. 1.

Diagnosis.—Among the species with four marginal pegs on the jugum this one may be recognized by its extremely small size (length of body, 1.60) and the very short labium which does not attain middle coxae.

Description.—Based on the male paratype, the only specimen available for study. Elongate-oval, sides subparallel.

Head: Length about three-fourths width, 0.34:0.43; interocular width, 0.24; clypeus very slightly surpassing apices of juga but continuing outline; surface with coarse, close punctures, except on transversely rugulose clypeus; jugum with four marginal pegs. Antennal segments: I, 0.08; II, 0.02; III, 0.15; IV, 0.13; V, 0.16. Bucculae

almost half as long as labial I, not as high as labial II; labium reaching middle of mesosternum. Labial segments: I, 0.12; II, 0.14; III, 0.20; IV, 0.13.

Pronotum: Length two-thirds width, 0.63:0.90; anterior margin very feebly doubly emarginate, cupped behind eyes; lateral margin feebly sinuate at basal third; transverse impression obtuse, feebly impressed, its included row of punctures not enlarged; anterior lobe subapically and laterally with two irregular rows of coarser punctures, midline and large patch on calli with numerous smaller punctures; posterior lobe, except umbones, with numerous distinct punctures becoming finer posteriorly.

Scutellum: Wider than long, 0.53:0.36.

Hemelytron: Mesocorium impunctate discally except at extreme outer, apical angle; exocorium uniformly and closely punctured over entire area.

Propleuron: Prosternal carinae lobulate, about as high as labial II, slightly more steeply terminated posteriorly.

Legs: Anterior femur ventrally with oblique, stout, blunt, premedian spine; anterior tibia neither angled nor spined ventrally near middle; posterior femur ventrally with oblique, simple, subapical spine, dorsally with subapical angulation; posterior tibia more or less compressed, straight.

Length of body: 1.60.

Type data.—Barber gave the type locality of his male type (USNM) as "Adjuntas, Porto Rico."

Specimen studied.—1 male (USNM 51580), Adjuntas, Puerto Rico, Apr. 21, 1933, Faxon, Anderson, Mills, Oakley, in net above woods.

Discussion.—The present concept of this species is based on the male paratype (USNM). The specimen agrees well with the original description and figure, differing only in the spelling of the trivial name on the determination label, where it is spelled without the "a," obviously a lapsus.

Amnestus explanatus, new species

Plate figures 64, 290

Diagnosis.—Among the species with four marginal pegs on each jugum, this one may be recognized by the narrowly but distinctly explanate costal margins plus the anterior margin of the pronotum being distinctly wider than the head (fig. 64).

Description.—Based on the holotype male. Elongate, subparallel.

Color: Yellowish brown, coria, legs, and labium somewhat paler.

Head: Length more than three-fourths width, 0.44:0.56; interocular width, 0.27; clypeus distinctly surpassing apices of juga; latter with

four, small marginal pegs; surface, except clypeus, with coarse, close punctures. Antennal segments: I, 0.10; II, 0.02; III, 0.26; IV and V missing. Labium reaching mesosternum. Labial segments: I, 0.19; II, 0.23; III, 0.25; IV, 0.22.

Pronotum: Length more than half width, 0.73:1.24; anterior margin wider than head, broadly, moderately concave, lateral angle cupped behind eye; lateral margin straight and subparallel on basal half; transverse impression obtuse, punctate; anterior lobe moderately tumid, coarsely punctate laterally, subapically, along midline and over most of disc of calli; posterior lobe with crowded, coarse punctures, except on dorsolateral face of umbones.

Scutellum: Length-width ratio, 0.50:0.60.

Hemelytron: Mesocorium discally virtually impunctate; exocorium closely and coarsely punctate for full width; costal margin narrowly but distinctly explanate and recurved, width of explanate area nearly equal to diameter of hind tibia.

Propleuron: Prosternal carinae higher than labial II, ventral margin distinctly concave.

Legs: Anterior femur ventrally with straight, simple, oblique spine near basal third; anterior tibia ventrally with very weak, obtuse angulation medially; posterior femur ventrally with subapical spine very short, oblique, simple, acute.

Terminalia: Gonostylus as illustrated (fig. 290).

Length of body: 2.21.

Type data.—Holotype male (JCL) labeled "Horqueta, Paraguay, 45 miles E, Paraguay Riv.,I–27, 1934, Alberto Schulze."

Discussion.—The unusual condition of the explanate costal margin suggested the specific name proposed here.

Amnestus forreri Distant

Plate figure 291

Amnestus forreri Distant, 1893, p. 452

Diagnosis.—The present species and *cribratus* differ from all other species of *Amnestus* with five marginal pegs on jugum in having numerous distinct punctures on the pronotal umbones and having most of the disc of the calli coarsely and closely punctate similar to the lateral parts of the anterior pronotal lobe; they may be separated from each other by the shape of the prosternal carinae—*cribratus* has these structures concave ventrally with a strongly triangular lobe anteriorly, while *forreri* has the ventral margin of these carinae virtually straight.

Description.—Based on two males. Elongate-oval, sides almost parallel.

Color: Most of head, anterior lobe of pronotum, scutellum, and

most of ventral surface yellowish brown; posterior lobe of pronotum, clavi, coria and appendages yellowish.

Head: Length slightly shorter than width, 0.60(0.60–0.60):0.66 (0.66–0.67); interocular width, 0.38(0.37–0.40); clypeus surpassing juga by distance equalling one-half its own width; surface coarsely and closely punctate except on clypeus and apical halves of juga; jugum with five marginal pegs, anterior one or two abruptly longer than others. Antennal segments: I, 0.13(0.13–0.14); II, 0.03(0.03–0.04); III, 0.30(0.30–0.30); IV, 0.26(0.26–??); V, 0.30(0.30–??). Labium reaching almost to bases of middle coxae. Labial segments: I, 0.24(0.23–0.26); II, 0.38(0.36–0.41); III, 0.25(0.24–0.26); IV, 0.23(0.23–0.24).

Pronotum: Length three-fourths width, 1.23(1.23–1.23):1.61(1.61–1.62); anterior margin very feebly concave, cupped behind eyes; lateral margin sinuate near base; transverse impression weak except laterally, marked by row of coarse punctures; anterior lobe with broad band of coarse punctures laterally and subapically; and with numerous close-set moderate punctures along midline and over most of calli; posterior lobe, including umbones, with very numerous, close-set punctures becoming finer posteriorly.

Scutellum: Wider than long, 0.85(0.84–0.85):0.67(0.66–0.68).

Hemelytron: Mesocorium impunctate except for two rows paralleling claval suture; exocorium distinctly and strongly punctate virtually to costa.

Propleuron: Prosternal carinae higher than labial II, anterior margin roundingly perpendicular, ventral margin straight and almost horizontal, posterior end lower but abruptly terminated.

Legs: Anterior femur ventrally with premedian oblique spine very unevenly furcate and with subapical small tubercle on posteroventral margin; anterior tibia ventrally neither angled nor spined at middle; posterior femur ventrally with subapical spine stout, oblique, shorter than height of femur, subequally furcate at apex, dorsally with subapical angulation.

Terminalia: Gonostylus as illustrated (fig. 291).

Length of body: 2.89(2.82–2.96).

Type data.—The types (BrM) are listed as coming from "Mexico, Ventanas in Durango (Forrer): Panama, Volcan de Chiriqui 4000 to 6000 feet (Champion)."

Specimens studied.—2 males.

Panama: *Canal Zone:* Barro Colorado Island, Oct.–Nov., 1941, Jas. Zetek· No. 4915, 1 male (USNM). Cano Saddle, Gatun Lake, May 3, 1923, R. C· Shannon, 1 male (USNM).

Discussion.—The two individuals reported on here were the only Central American specimens seen with the anterior pronotal lobe

being darker than the posterior one. This unusual feature coupled with the fact that both specimens came from one of the original countries of capture combine to establish the present interpretation of Distant's species. This result conforms with H. G. Barber's conclusions as one of the specimens bears his determination as *forreri*.

Amnestus foveatus, new species

Plate figure 39, 293

Diagnosis.—The greatly enlarged prosternal carinae with the large blackened fovea will separate *foveatus* from the other species of the genus.

Description.—Male: Elongate-oval, widest behind middle.

Head: Length more than two-thirds width, 0.47(0.42–0.53):0.61 0.56–0.67); interocular width, 0.35(0.33–0.38); clypeus slightly surpassing apices of juga; surface shining, anteocular part impunctate, remainder with numerous crowded punctures; jugum with five small marginal pegs becoming shorter and finer toward eyes. Antennal segments: I, 0.13(0.13–0.15); II, 0.04(0.03–0.05); III, 0.23(0.23–0.26); IV, 0.22(0.20–0.26); V, 0.23(0.23–0.25). Bucculae reduced, about one-third as long as labial I and subequal to it in height; labium reaching apices of hind coxae. Labial segments: I, 0.21(0.19–0.26); II, 0.25(0.23–0.26); III, 0.25(0.23–0.27); IV, 0.23(0.23–0.25).

Pronotum: Length two-thirds width, 0.90(0.78–1.02):1.45(1.36–1.61); anterior margin doubly emarginate, cupped behind eyes; lateral margin with broad, shallow, rounded emargination near base; transverse impression distinct, marked by row of coarse punctures; anterior lobe feebly or not tumid, with broad band of coarse punctures subapically and laterally, calli and intercallar area with numerous, moderate, distinct punctures; posterior lobe, except umbones, with numerous separated punctures becoming obsolete posteriorly.

Scutellum: Wider than long, 0.62(0.58–0.70):0.57(0.54–0.64); disc polished, with numerous coarse punctures.

Hemelytron: Mesocorium discally with scattered small punctures; exocorium uniformly punctured throughout.

Propleuron: Prosternal carinae subquadrate, more than twice as high as labial II, with large fuscous to black fovea basally on posterior half (fig. 39).

Legs: Anterior femur with stout, submedian ventral spine with shallow emargination in apical truncation; anterior tibia with ventral margin neither angled nor spined; posterior tibia ventrally with subapical angulation on spine, and dorsally with subapical angulation.

Terminalia: Gonostylus as illustrated (fig. 293).

Length of body: 2.41(2.21–2.66).

Female: Similar to male, but anterior and posterior femora without armature described for that sex.

Head: Length-width ratio, 0.48(0.44–0.51):0.60(0.57–0.63); interocular width, 0.35(0.34–0.40). Antennal segments: I, 0.13(0.13–0.15); II, 0.03(0.03–0.04); III, 0.22(0.22–0.23); IV, 0.20(0.19–0.22); V, 0.23(0.23–0.24). Labial segments: I, 0.22(0.21–0.23); II, 0.25(0.23–0. 27); III, 0.25(0.23–0.27); IV, 0.21(0.20–0.23).

Pronotum: Length-width ratio, 0.79(0.72–0.86):1.40(1.35–1.31).

Scutellum: Length-width ratio, 0.56(0.53–0.61):0.62(0.60–0.66).

Length of body: 2.28(2.15–2.47).

Type data.—Holotype male (JCL) and allotype female (JCL), "Nova Teutonia. Sta. Catarina, Brazil, X–II, 1952, F. Plaumann." Paratypes: Same data as types but various dates: 5 males, Aug. 8, Sept. 24, and Oct. 11; 8 females, Aug. 8, 18, Oct. 5, 9, 11, 14, 23 (all JCL).

Discussion.—The prominent, blackened fovea near the base of the prosternal carinae suggested the specific name.

Amnestus lateralis Signoret

Plate figure 286a

Amnestus lateralis Signoret, 1883, p. 369, pl. 10, fig. 193.—Lethierry and Severin, 1893, p. 75.

Diagnosis.—Among the species with five jugal pegs, this species may be recognized by its hemelytral color—the clavus and basal area of the mesocorium are much lighter than the exocorium and apical part of the mesocorium; or structurally it is separable from all the above-mentioned species by having the mesocorial disc sparsely but evenly punctate for its full length, i.e., without a submedian, impunctate area.

Description.—Based on one male and one female. Male: Elongate, sides subparallel.

Head: Length more than three-fourths width, 0.54:0.65; interocular width, 0.39; clypeus slightly surpassing juga; latter with five marginal pegs, anteocular part polished, impunctate. Antennal segments: I, 0.18; II. 0.07; III, 0.35; IV, 0.27; V, 0.30. Labium reaching bases of middle coxae. Labial segments: I, 0.20; II, 0.26; III, 0.35; IV, 0.23.

Pronotum: Length more than half width, 1.09:1.66; anterior margin deeply concave, anterolateral angles truncated behind eyes; lateral margins straight and slightly converging on basal half, thence broadly rounded to apex; transverse impression deep, sinuate, punctate; anterior lobe with subapical band of coarse punctures, with few scattered minute punctures on midline and calli and laterally with one or two rows of punctures finer than those of transverse impression;

posterior lobe with numerous well-separated punctures becoming finer posteriorly; umbones impunctate.

Scutellum: Length-width ratio, 0.68:0.86.

Hemelytron: Exocorium with numerous, close, moderately coarse punctures across full width; mesocorial disc with sparser, finer punctures scattered along full length.

Propleuron: Prosternal carinae about as high as labial II, margins strongly convex.

Legs: Anterior femur with submedian spine strongly oblique, apex weakly and unevenly furcate, posteroventral margin with distinct, subapical spine; anterior tibia with median ventral angulation but no subbasal spine; posterior femur with a prominent, tubercle-like angulation dorsally near apex, and ventrally with a strong, simple subapical spine which is curved posteriorly.

Terminalia: Gonostylus as illustrated (fig. 286a).

Length of body: 2.64.

Female: Similar to male but lacking leg modifications mentioned for that sex and having transverse pronotal impression obtuse.

Head: Length-width ratio, 0.53:0.61; interocular width, 0.38. Antennal segments: I, 0.12; II, 0.07; III, 0.26; IV and V missing. Labial segments: I, 0.18; II, 0.21; III, 0.40; IV, 0.14.

Pronotum: Length-width ratio, 0.81:1.46.

Scutellum: Length-width ratio, 0.60:0.71.

Length of body: 2.24.

Type data.—Signoret described this species from specimens from "Brésil" and "Buenos-Ayres." The types have not been located.

Specimens studied.—1 male and 1 female:

Argentina: La Plata, 1 male, 1 female (Hung).

Discussion.—Signoret's description and illustration of the mesocorial punctation and the unique corial coloring leave no doubt about the identity of this form. The only real discrepancy between the specimens available and his illustration lies in the few lateral punctures on the anterior pronotal lobe in contrast to the crowded punctures of the sketch.

Amnestus lautipennis (Stål)

Plate figures 75, 292

Magoa lautipennis Stål, 1860, p. 14.—Walker, 1867, p. 170.
Amnestus lautipennis Stål, 1876, p. 21.—Signoret, 1883, p. 371, pl. 10, fig. 196.—Lethierry and Severin, 1893, p. 75.

Diagnosis.—The low, rounded prosternal carinae coupled with the unmarked, yellow coria which are distinctly paler than the dark brown pronotum and scutellum will mark this from the other small (less than 2.5) species with five marginal, jugal pegs.

Description.—Based on two males. Oval, widest behind middle.

Color: Head, pronotum and scutellum reddish brown, coria yellow, unmarked; venter paler reddish brown, legs and labium yellow.

Head: Length about four-fifths width, 0.42(0.41–0.44):0.52(0.52–0.53); interocular width, 0.31(0.30–0.31); clypeus slightly longer than juga; latter with five marginal pegs; surface distinctly punctate on juga and between eyes. Antennal segments: I, 0.12(0.12–0.13); II, 0.03 (0.03–0.03); III, 0.17(0.16–0.18); IV, 0.20(0.20–0.20); V, 0.22(0.21–0.23). Labium reaching bases of middle coxae. Labial segments: I, 0.17(0.16–0.18); II, 0.23(0.23–0.23); III, 0.26(0.26–0.27); IV, 0.22(0.21–0.23).

Pronotum: Length about two-thirds width, 0.79(0.74–0.84):1.20 (1.16–1.25); anterior margin shallowly concave; lateral margins straight on basal half; transverse impression distinct, with row of coarse punctures; anterior lobe moderately tumid, with several rows of coarse punctures laterally and subapically, with few small punctures on midline and on disc of calli; posterior lobe with scattered punctures; umbones impunctate, not continued to anterior lobe as impunctate ridge.

Scutellum: Length-width ratio, 0.44(0.43–0.45):0.53(0.50–0.56).

Hemelytron: Mesocorium with few scattered punctures apically; exocorium punctate for full width.

Propleuron: Prosternal carinae lower than labial II, rounded.

Legs: Anterior femur ventrally with oblique, stout, unequally furcate spine near basal third; anterior tibia not angled near middle of ventral margin; posterior femur ventrally with subapical spine compressed, obliquely truncated at apex, as long as two-thirds femoral height.

Terminalia: Gonostylus as illustrated (fig. 292).

Length of body: 2.08(1.89–2.28).

Type data.—Since no type locality was recorded by Stål, one may assume from the title of his paper that it was Rio de Janeiro. The type specimen (Stock), a male, bears the simple label "Brasil."

Specimens studied.—2 males.

Brazil: No exact locality, "Typus," 1 male (Stock); on cabbage, intercepted at New Orleans, La., Mar. 9, 1938, 1 male (USNM).

Amnestus pallidus Zimmer

Plate figure 294

Annectus [!] *pallidus* Zimmer, 1910, p. 166, fig. 10.
Amnestus pallidus Van Duzee, 1917, p. 23.—Torre Bueno, 1939, p. 183.

Diagnosis.—The almost concolorous reddish brown head, pronotum, scutellum, and corium, plus the shorter labium which does

not reach posterior coxae, will separate this species from all of those with five marginal pegs on the jugum.

DESCRIPTION.—Color: Dorsally and ventrally, except for legs and labium, almost unicolorous reddish brown to piceous.

MALE: Oval, widest behind middle.

Head: Length more than three-fourths width, 0.44(0.40–0.53): 0.57(0.50–0.70); interocular width, 0.36(0.31–0.44); clypeus as long as juga, latter with five subequal, marginal pegs; surface, except clypeus and apex of jugum, coarsely punctate. Antennal segments: I, 0.12(0.10–0.17); II, 0.03(0.02–0.04); III, 0.28(0.23–0.36); IV, 0.28(0.23–0.33); V, 0.28(0.23–0.36). Labium attaining middle of metasternum. Labial segments: I, 0.22(0.20–0.26); II, 0.30(0.27–0.39); III, 0.39(0.31–0.53); IV, 0.26(0.23–0.31).

Pronotum: Length about two-thirds width, 0.90(0.76–1.30):1.44 (1.21–1.44); anterior margin shallowly concave, almost straight across; lateral margin straight on basal half; transverse impression obsolete, marked by vague row of punctures; anterior lobe with three to four irregular rows of moderate to coarse punctures laterally, subapically and along median band, calli mostly polished, with few fine punctures discally; posterior lobe, except umbones, with widely scattered punctures.

Scutellum: Length-width ratio, 0.61(0.50–0.81):0.74(0.63–0.90).

Hemelytron: Mesocorium with few scattered, obsolete punctures discally; exocorium abundantly punctate across full width.

Propleuron: Prosternal carinae lower than labial II, rounded.

Legs: Anterior femur ventrally with premedian spine strong, oblique, unevenly bifid, and with blackish, subapical tubercle on posteroventral margin; anterior tibia neither angled nor spined midventrally; posterior femur not angled dorsally near apex, ventrally with subapical spine short, less than half height of femur.

Terminalia: Gonostylus as illustrated (fig. 294).

Length of body: 2.56(2.08–3.26).

FEMALE: Similar to male, but without secondary sexual modifications.

Head: Length-width ratio, 0.48(0.43–0.60):0.60(0.53–0.73); interocular width, 0.36(0.31–0.46). Antennal segments: I, 0.12(0.10–0.16); II, 0.03(0.02–0.04); III, 0.25(0.20–0.33); IV, 0.24(0.19–0.32); V, 0.25(0.20–0.33). Labial segments: I, 0.21(0.20–0.23); II, 0.24 (0.23–0.26); III, 0.36(0.31–0.46); IV, 0.24(0.20–0.33).

Pronotum: Length-width ratio, 0.92(0.80–1.16):1.53(1.31–1.92).

Scutellum: Length-width ratio, 0.63(0.51–0.90):0.77(0.63–0.99).

Length of body: 2.60(2.28–3.20).

TYPE DATA.—Zimmer listed his lone type as a female, but illustrated the typical leg armature of a male, from "South-east Nebraska."

According to a letter from the late Dr. Myron Swenk to Dr. Sailer, the type specimen of this species was accidently knocked from its pin and lost while it was being incorporated in the collection of the University of Nebraska.

SPECIMENS EXAMINED.—59 males, 107 females.

UNITED STATES: *Arizona:* Oak Creek Canyon, Williams; July. *California:* El Dorado Co., Los Angeles Co., Madera Co.; September. *Colorado:* No exact locality. *Georgia:* Spalding Co.; March. *Illinois:* Algonquin, Aurora, Oakwood, Urbana, White Heath; April to October. *Indiana:* Knox, Marion Co.; July. *Iowa:* Ames, Boone Co., Iowa City, Lake Okoboji, Louisa Co., Moran, Washington; April to October. *Kansas:* Ashland, Lawrence; June, July. *Kentucky:* McCraken Co.; September. *Maryland:* Cabin John; April. *Massachusetts:* Cambridge, Natick; June. *Michigan:* Washtenaw Co.; May. *Nebraska:* West Point; June. *New Jersey:* Bear Swamps, Hackettstown, Madison; May, July. *New Mexico:* Las Vegas, Mesilla Park, West Point; May, July. *New York:* Maspeth, Mosholu, West Hebron; May. *North Carolina:* Black Mts., Gray Beard Mt.; May, September. *Oregon:* Corvallis, McMinnville; October. *Pennsylvania:* Ingram, Philadelphia; May, June, September. *Tennessee:* Hamilton Co.; October. *Texas:* Denison; November. *Virginia:* Augusta Co., Chain Bridge, Fairfax Co.; May, July, September. *Washington:* Puyallup; March.

CANADA: *Ontario:* Ridgeway; October.

DISCUSSION.—In most collections examined, this species has been confused with *spinifrons*. The shorter labium, which here does not exceed the posterior coxae, will separate the two; or in the case of the males, the absence of a midventral angulation on the anterior tibia will mark it from *spinifrons*.

Zimmer's description of his specimen as a female was the result of confusion of the two sexes that was prevalent at that time.

Although several authors have reported this form from light, real ecological notes concerning it are quite few. Blatchley (1926) and Torre Bueno (1939) repeated Stoner's (1920) record of sweeping it from *Antennaria plantaginifolia* (L.) in Iowa. Parshley (1923, p. 780) reported that it may be "occasionally found under stones and by sifting."

***Amnestus pusillus* Uhler**

PLATE FIGURES 63, 163, 164, 184, 295

Amnestus pusillus Uhler, 1876, p. 278; 1877, p. 371; 1886, p. 3.—Signoret, 1883, p. 372, pl. 10, fig. 197.—Lethierry and Severin, 1893, p. 75.—Banks, 1910, p. 98.—Van Duzee, 1917, p. 23.—Torre Bueno, 1939, p. 183.

DIAGNOSIS.—The male of *pusillus* may be easily recognized by the presence on the hind femur of a ventral, subapical spine which is more than one-third as long as the tibia (fig. 164). The female is also strongly marked by the presence of a flattened, polished, glabrous area on the middle of the last sternite (fig. 184) and the presence of a short, oblique, subapical spine on the ventral margin of the posterior

femur (fig. 163), two features which appear to be unique with this species.

Description.—Color: Yellowish tan, coria, legs, and labium usually paler.

Male: Oval, widest behind midlength.

Head: Length three-fourths width, 0.42(0.41–0.43):0.56(0.53–0.60); interocular width, 0.32(0.31–0.34); clypeus slightly surpassing juga; latter with four marginal pegs becoming finer toward eye; surface, except clypeus, roughly punctate. Antennal segments: I, 0.10(0.07–0.13); II, 0.02(0.02–0.03); III, 0.23(0.21–0.25); IV, 0.23(0.23–0.25); V, 0.23(0.21–0.25). Labium reaching bases of posterior coxae. Labial segments: I, 0.18(0.17–0.20); II, 0.26(0.26–0.27); III, 0.28 (0.26–0.30); IV, 0.23(0.20–0.26).

Pronotum: Length more than two-thirds width, 0.91(0.84–1.03): 1.32(1.24–1.50); anterior margin moderately concave; lateral margin faintly concave on basal third; transverse impression distinct, marked by regular row of coarser, closer punctures; anterior lobe with coarse punctures in three or four rows laterally and subapically, and along midline and scattered over calli; posterior lobe, except umbones, abundantly punctate.

Scutellum: Length-width ratio, 0.59(0.53–0.66):0.65(0.61–0.72).

Hemelytron: Mesocorium discally with single, irregular row of fine punctures; exocorium punctate for full width.

Propleuron: Prosternal carinae almost as high as labial II, abruptly terminated posteriorly.

Legs: Anterior femur ventrally with submedian spine very short, simple; anterior tibia with two prominent angulations or spines on lower edge (as in fig. 132); posterior femur ventrally with subapical spine very long, more than third length of posterior tibia (fig. 164).

Terminalia: Gonostylus as illustrated (fig. 295).

Length of body: 2.30(2.08–2.66).

Female: Similar to male, but lacking secondary sexual modifications; posterior femur with small, oblique spine ventrally near apex (fig. 163).

Head: Length-width ratio, 0.43(0.43–0.44):0.54(0.53–0.55); interocular width, 0.33(0.33–0.33). Antennal segments: I, 0.10(0.09–0.12); II, 0.02(0.02–0.02); III, 0.21(0.20–0.23); IV, 0.21(0.20–0.23); V, 0.22(0.21–0.24). Labial segments: I, 0.16(0.16–0.17); II, 0.25 (0.23–0.28); III, 0.33(0.33–0.33); IV, O.25(0.25–0.27).

Pronotum: Length-width ratio, 0.73(0.70–0.74):1.24(1.23–1.26).

Scutellum: Length-width ratio, 0.51(0.50–0.53):0.56(0.56–0.57).

Length of body: 2.19(2.15–2.28).

Type data.—The types are in the U.S. National Museum. In the original description, Uhler reported that this species "Inhabits

Indian Territory, Texas, Cuba, and generally the Eastern United States south of Cape Cod."

Specimens studied.—103 males, 154 females.

Canada: *Ontario:* Ridgeway; October.

United States: *Arizona:* Globe, San Carlos, Thatcher; July, August. *Arkansas:* Hope; October. *California:* Folsom. *Colorado:* No exact locality. *Illinois:* Grand Tower, Pittsfield, Urbana; July, August. *Iowa:* Ames, 4 miles east of Gilbert; May to July. *Kansas:* Caldwell, Riley Co., Wellington; June, July. *Kentucky:* Henderson Co.; September. *Louisiana:* Harahan, Shreveport, Tallulah; July to September. *Maine:* Paris; October. *Maryland:* Plummers Island, Sparrow Point; June to August. *Massachusetts:* Chicopee; August. *Missouri:* Charleston, Columbia, Kansas City, Kinsey, Langdon, Rockport, St. Joseph, St. Louis, Webster Groves; April to September. *Nebraska:* Falls City, Minden; August. *New York:* Queens Co.; June. *Oregon:* Forest Grove; June. *Pennsylvania:* Crisp, Philadelphia, Pittsburgh; August. *Tennessee:* Chattanooga, Clarksville, Hamilton Co., Nashville; July, August, November. *Texas:* Dallas, Devil's River, Kerrville, Victoria; June, July. *Virginia:* Falls Church, Nelson Co.; July, September. *West Virginia:* Cheat Mts.; June.

Mexico: *Nuevo León:* Monterrey; August.

Guatemala: Two specimens labeled "Guatemala" were intercepted during plant inspections in California and Texas; perhaps these represent specimens that had entered shipments after their arrival.

Discussion.—The examination of a great number of specimens of this common species gave a rather comprehensive picture of the range—North America from Maine and Ontario west to Oregon and south to Virginia, Louisiana, and Mexico. An interesting point that results is that *pusillus* is not a member of the West Indian fauna as reported by several early workers and refuted by later authors, including Barber (1939).

Uhler's (1894, p. 227) habit note that "This small insect lurks beneath rubbish in sandy places, where it matches the color of the ground and is thus easily overlooked," summarizes all of the available ecological information on this form except the frequency and abundance with which it comes to light.

Amnestus pusio (Stål)

Plate figures 162, 296

Magoa pusio Stål, 1860, p. 14.

Magao [!] *pusio* Walker, 1867, p. 171.

Amnestus pusio Stål, 1876, p. 21.—Signoret, 1883, p. 373, pl. 15, fig. 199.—Uhler, 1886, p. 3.—Lethierry and Severin, 1893, p. 75.—Barber and Bruner, 1932, p. 239.

Diagnosis.—The four marginal pegs on the jugum, the small size (1.2–2.1) and the presence of coarse punctures on the disc of the calli will separate this species and *basidentatus* from all others in the genus. The females of these two forms are as yet not separable with certainty, but the males of *pusio* lack spines or angulation on the ventral margin

of the anterior tibia and thereby differ markedly from the males of *basidentatus*, which have two prominent teeth on the ventral margin of the anterior tibia (as in fig. 132).

Description.—Color: Yellowish brown, posterior pronotal lobe and coria usually very slightly lighter, labium and legs pale yellow.

Male: Oval, widest posterior to midlength.

Head: Length about two-thirds width, 0.37(0.36–0.40):0.49(0.47–0.52); interocular width, 0.26(0.26–0.26); clypeus slightly surpassing juga, latter with four, subequal, marginal pegs; surface coarsely punctate between eyes. Antennal segments: I, 0.09(0.08–0.10); II, 0.01(0.01–0.02); III, 0.16(0.16–0.18); IV, 0.18(0.17–0.20); V, 0.20(0.19–0.22). Labium attaining posterior coxae. Labial segments: I, 0.14(0.14–0.16); II, 0.24(0.23–0.26); III, 0.26(0.23–0.30); IV, 0.22 (0.21–0.23).

Pronotum: Length about two-thirds width, 0.67(0.65–0.70):1.03 (1.00–1.06); anterior margin feebly concave; side margins straight or slightly sinuate on basal half; transverse impression prominent, with row of punctures; anterior lobe with large punctures laterally, subapically, medially and scattered over calli; posterior lobe, except umbones, with numerous close-set, coarse punctures.

Scutellum: Length-width ratio, 0.43(0.41–0.46):0.49(0.46–0.53).

Hemelytron: Mesocorium with several small scattered punctures discally; exocorium abundantly punctate across full width.

Propleuron: Prosternal carinae about as high as labial II, more or less abruptly terminated posteriorly.

Legs: Anterior femur ventrally with premedian spine simple or weakly bifid at apex, posteroventral margin with minute, subapical tubercle; anterior tibia neither spined nor distinctly angled on ventral margin; posterior femur ventrally with prominent, triangular tooth near apex of anteroventral margin (fig. 162).

Terminalia: Gonostylus as illustrated (fig. 296).

Length of body: 1.82(1.82–1.84).

Female: Similar to male, lacking secondary sexual modifications.

Head: Length-width ratio, 0.41(0.38–0.46):0.54(0.53–0.57); interocular width, 0.31(0.30–0.32). Antennal segments: I, 0.09(0.09–0.10); II, 0.01(0.01–0.02); III, 0.23(0.17–0.30); IV, 0.21(0.20–0.23); V, 0.22(0.20–0.23). Labial segments: I, 0.15(0.14–0.16); II, 0.24(0.23–0.26); III, 0.25(0.23–0.26); IV, 0.22(0.20–0.25).

Pronotum: Length-width ratio, 0.66(0.63–0.73):1.09(1.06–1.16).

Scutellum: Length-width ratio, 0.45(0.44–0.47):0.54(0.51–0.56).

Length of body: 1.91(1.82–2.02).

Type data.—Stål's type specimen (Stock), a male, bears the word "Brasil" as the locality of capture. No locality was given in the

original description, but the title of Stål's paper suggested that all included forms had come from Rio de Janeiro.

SPECIMENS STUDIED: 138 males.

UNITED STATES: *Texas:* Brownsville; June.

MEXICO: *Chiapas:* Tapachula. *Sinaloa:* Presidio River; September. *Veracruz:* Tres Zapotes, Pureza; April, June.

HONDURAS: Lacertilla, Lombardia, Tela.

COSTA RICA: Hamburg Farm; March, April.

PANAMA: *Canal Zone:* Ancón, Barro Colorado Island; January, April, July.

COLOMBIA: No exact locality.

BRAZIL: No exact locality, type.

ECUADOR: Cachabi.

BAHAMAS: South Bimini Island; June.

CUBA: Baragua, Guantánamo, Santo Tomás; May, June.

HAITI: "Diquini," Port au Prince; July, August, November.

DOMINICAN REPUBLIC: San Francisco Mts.; January, September.

PUERTO RICO: Isabella, Ponce, San Juan; March, August.

VIRGIN ISLANDS: St. Croix; May, November.

GRENADA: Balthazar.

DISCUSSION.—Although a number of authors reported this species for the southeastern United States, the large series of *Amnestus* from that region did not yield any specimens. Instead, most of those records appear to belong to the common southeastern species *basidentatus*, which is described as new in the present paper. Another point of interest in relation to the distribution of this species lies in the fact that all specimens, except the type, were found to have come from an area far to the north of the type locality in southern Brazil.

The present state of knowledge does not permit certain recognition of the females of this species. The only female specimens reported upon for the distribution data in this paper were those from within the range indicated by males.

***Amnestus radialis*, new species**

PLATE FIGURES 61, 76, 297

DIAGNOSIS.—Among those species with five pegs on jugal margins, this species may be recognized by the fuscous line along the radial vein and the four long pegs on the apex of the clypeus.

DESCRIPTION.—Based on one male. Elongate, sides subparallel.

Head: Length about three-fourths width, 0.46:0.61; interocular width, 0.33; clypeus slightly surpassing apices of juga, latter with five marginal pegs becoming finer toward eye; surface punctate between eyes. Antennal segments: I, 0.12; II–V, missing. Labium attaining middle coxae. Labial segments: I, 0.16; II, 0.23; III, 0.23; IV, 0.23.

Pronotum: Length more than two-thirds width, 0.96:1.38; anterior margin shallowly concave; lateral margins strongly narrowing from base, slightly concave on basal half; transverse impression moderate,

marked by regular row of crowded, very coarse, elongate punctures; anterior lobe moderately tumid, with two irregular rows of coarse punctures laterally and subapically, disc of calli and midline with scattered, fine punctures; posterior lobe with numerous punctures, these coarser on apical half; umbones impunctate.

Scutellum: Length-width ratio, 0.56:0.67.

Hemelytron: Apical half of mesocorium mostly impunctate; exocorium abundantly punctate for full width.

Propleuron: Prosternal carinae about as high as labial II, obtusely triangular.

Legs: Anterior femur ventrally with large, unevenly furcate spine near basal third; anterior tibia with low, blunt angulation near middle of ventral margin; posterior femur dorsally with subapical angulation, ventrally with weakly curved, subapical spine about as long as two-thirds femoral height.

Terminalia: Gonostylus as illustrated (fig. 297).

Length of body: 2.47.

Type data.—Holotype male (USNM 64409), "Martinique, W. I., 8–21–29, Bartsch-Hoffmann."

Discussion.—The following species, described as new on the basis of six distinct pegs on the apex of the clypeus, may be simply the female of *radialis*. Female specimens that run to the present species should be checked against the next one to determine if they are not the same and to help evaluate the feature of the additional pegs on the clypeus.

Amnestus sexdentatus, new species

Plate figure 60

Diagnosis.—The present form, if not based on an aberrant individual, is unique within the genus in possessing six pegs at the apex of the clypeus, the usual four along the margin and one above and one below the margin on the midline (fig. 60).

Description.—Based on one female. Oval, widest behind mid-length.

Head: Length about four-fifths width, 0.47:0.58; interocular width, 0.32; clypeus slightly surpassing apices of juga, with six pegs apically, usual four along margin and one above and one below margin on mid-line (fig. 60); surface with coarse punctures between eyes. Antennal segments: I, 0.12; II, 0.05; III, 0.23; IV, 0.31; V, missing. Labium attaining middle coxae. Labial segments: I, 0.16; II, 0.26; III, 0.23; IV, 0.16.

Pronotum: Length about three-fourths width, 0.83:1.36; anterior margin shallowly concave; lateral margins strongly narrowing from base, straight on basal half; transverse impression strong only at ends, marked by irregular row of coarse punctures; anterior lobe with two

rows of coarse punctures laterally and subapically, calli and space between with few minute punctures; posterior lobe with widely scattered, fine punctures, umbones impunctate.

Scutellum: Length-width ratio, 0.56:0.68.

Hemelytron: Mesocorium with scattered, distinct punctures for full length; exocorium abundantly punctate to costal margin.

Propleuron: Prosternal carinae less than half as high as labial II, rounded.

Length of body: 2.24.

Color: Head, anterior pronotal lobe and scutellum dark reddish brown; posterior pronotal lobe, except immediately mesad of umbones and along narrow posterior margin, yellowed; clavus and corium yellow, former with apical cloud fuscous, corium with subbasal spot, irregular band along radial vein, and apical margin fuscous; venter mostly reddish brown; labium and legs yellow.

Type data.—Holotype female (USNM 64410), "Ponce, P. R., IV-4-1946, L. T., J. Maldonado Capriles."

Discussion.—Whether or not the unusual development of two additional pegs on the apex of the clypeus is abnormal must be proven by examination of additional specimens. If the extra pegs prove to be a freak condition, then this may simply be the female of *A. radialis*, new species, to which this specimen will then run in the key.

Amnestus spinifrons (Say)

Plate figures 2, 37, 113, 131, 160, 168, 173, 185, 298

Cydnus spinifrons Say, 1825, p. 316.

Amnestus spinifrons Dallas, 1851, p. 126.—Walker, 1867, p. 167—Stål, 1876, p. 21.—Uhler, 1877, p. 370; 1886, p. 3.—Signoret, 1883, p. 367, pl. 10, fig.192. —Lethierry and Severin, 1893, p. 75.—Banks, 1910, p. 99.—Van Duzee, 1917, p. 23.—Torre Bueno, 1939, p. 182.

Diagnosis.—Among those species with the five pegs on each jugum, this species may be recognized by the very long labium which surpasses the hind coxae.

Description.—Color: Dark reddish brown, appendages paler.

Male: Elongate, sides subparallel.

Head: Length more than three-fourths width, 0.58(0.53–0.66): 0.73(0.65–0.78); interocular width, 0.45 (0.42–0.50); clypeus as long as juga, apices continuous; jugum with five marginal spines; surface coarsely punctate on jugum and between eyes. Antennal segments: I, 0.17(0.14–0.20); II, 0.05(0.05–0.06); III, 0.33(0.30–0.36); IV, 0.31(0.27–0.34); V, 0.30(0.26–0.33). Labium reaching apex of sternite III. Labical segments: I, 0.33(0.30–0.40); II, 0.51(0.43–0.56); III, 0.75(0.66–0.83); IV, 0.42(0.40–0.44).

Pronotum: Length about two-thirds width, 1.23(0.95–1.42):1.84-

(1.55–2.02); anterior margin shallowly emarginate; lateral margins constricted subbasally; transverse impression weaker medially, marked by band of coarse punctures; anterior lobe moderately tumid, coarsely punctate laterally and subapically, finely punctate medially and on calli; posterior lobe with scattered, small punctures becoming finer posteriorly, unbones not punctate.

Scutellum: Length little less than width, 0.81(0.65–0.91):0.94-(0.78–1.04).

Hemelytron: Mesocorium abundantly punctate except in post-median area; exocorium closely punctate for full width.

Propleuron: Prosternal carinae rounded, almost as high as labial II.

Legs (figs. 131, 160): Anterior femur with strong, bifid spine ventrally on basal third and small simple one near apex on posterior margin; anterior tibia with decided median angulation ventrally; posterior femur with very short, oblique spur subapically on antero-ventral margin.

Terminalia: Gonostylus as illustrated (fig. 298).

Length of body: 3.43(2.66–3.68).

Female: Similar to male, anterior pronotal lobe not tumid, legs without modifications described.

Head: Length-width ratio, 0.62(0.56–0.66):0.73(0.66–0.80); inter-ocular width, 0.45(0.44–0.48). Antennal segments: I, 0.16(0.15–0.17); II, 0.05(0.05–0.06); III, 0.31(0.26–0.36); IV, 0.42(0.33–0.46).

Pronotum: Length-width ratio, 1.17(0.97–1.36):1.84(1.62–2.08).

Scutellum: Length-width ratio, 0.80(0.71–0.91):0.93(0.87–0.97).

Length of body: 3.15(2.79–3.51).

Type data.—The types, which Say described from "Pennsylvania" and "Missouri," are probably lost. Uhler (1878, p. 372), however, stated that there were specimens in the T. W. Harris collection (MCZ) which were named "*Cydnus spinifrons* by Mr. Say." These specimens, as well as specimens of certain other species in the Harris collection, have been considered in a special sense. Since Say's collections have been destroyed, and because these specimens represent some of the little-remaining material studied by Say, workers have generally accepted them as sort of substitute types for Say's species. The specimens of *spinifrons* listed by Uhler were reported as "No. 68, Harris Collection, Cambridge, Mass., March 18, 1828, May 15, 1831, Sept. 1831." Obviously, these cannot be the original types because the dates of capture are later than the publication date of the original description.

Specimens studied.—51 males, 42 females.

Canada: *Ontario:* Ridgeway; May.

United States: *Arkansas:* Washington Co.; May. *District of Columbia:* Washington, D.C. *Florida:* Homestead, Pompano; February. *Georgia:* Jasper

Co., Peach Co., Upson Co.; February, October. *Illinois:* Chicago, Homer, "N. Ill.," Urbana; March to May. *Iowa:* Ames, Boone, Lake Okoboji; April to June. *Kansas:* Riley Co.; April. *Maryland:* Annapolis, Beltsville; May. *Massachusetts:* Essex, Sherborn; May to July. *Missouri:* Piedmont; March *North Carolina:* Black Mt.; May. *New Jersey:* Great Notch, Mt. Pleasant, Roselle Park; May. *New York:* Aqueduct, Bayville, Hamburg, Ithaca, Long Island, New York City, Rockaway, Sabael, West Point, Yapahank; April to June, August, October. *Ohio:* St. Mary's; May. *Pennsylvania:* Castle Rock; May. *Tennessee:* Hamilton Co., Roane Co.; February. *Texas:* Tyler; February.

Discussion.—Several authors have listed conditions of capture for their specimens, as follows: Van Duzee (1894, p. 169), "Swept from weeds in low, swampy meadow"; Torre Bueno (1915, p. 277) "in beach drift"; Parshley (1923, p. 780), "sometimes found under stones in spring, after hibernation in the adult condition"; Hendrickson (1930, p. 66), "At *Andropogon furcatus* consocies"; Blatchley (1926, p. 87), "by sweeping herbage or sifting debris in low, moist grounds." Two of the specimens examined bore the field notes, "under drift" and "from soil."

Amnestus subferrugineus (Westwood)

Plate figures 38, 299

Cydnus subferrugineus Westwood, 1837, p. 19.

Amnestus subferrugineus Walker, 1868, p. 536.—Stål, 1876, p. 21.—Signoret, 1883, p. 373, pl. 10, fig. 198.—Lethierry and Severin, 1893, p. 75.—Barber and Bruner, 1932, p. 239.—Torre Bueno, 1939, p. 183.

Diagnosis.—Among those species with five jugal pegs and length less than 2.5, the present species may be recognized by the vertical anterior edges of the prosternal carinae (fig. 38) and the immaculate coria.

Description.—Color: Head, pronotum, scutellum and venter reddish brown; coria yellowish, immaculate; labium and legs yellow.

Male: Oval, widest behind middle.

Head: Length four-fifths width, 0.45(0.41–0.51):0.53(0.48–0.60); interocular width, 0.32(0.30–0.34); clypeus slightly surpassing apices of juga; latter with five marginal pegs becoming smaller toward eye; surface with coarse punctures between eyes. Antennal segments: I, 0.11(0.10–0.13); II, 0.03(0.03–0.04); III, 0.27(0.23–0.30); IV, 0.25(0.23–0.27); V, 0.30(0.29–0.31). Labium attaining middle of mesosternum. Labial segments: I, 0.16(0.16–0.18); II, 0.24(0.21–0.29); III, 0.29(0.24–0.32); IV, 0.21(0.20–0.23).

Pronotum: Length two-thirds width, 0.85(0.66–1.01):1.23(1.06–1.37); anterior margin shallowly concave; lateral margins weakly concave at basal fourth; transverse impression strongly impressed, marked by row of slightly coarser punctures; anterior lobe strongly tumid, higher than posterior lobe, virtually impunctate except for

two rows laterally and one subapically; posterior lobe, except calli with numerous, close-set punctures.

Scutellum: Length-width ratio, 0.51(0.43–0.56):0.59(0.50–0.68).

Hemelytron: Mesocorium with few scattered punctures apically; exocorium closely punctate across full width.

Propleuron: Prosternal carinae higher than labial II, bluntly triangular, anterior margin vertical (fig. 38).

Legs: Anterior femur ventrally with abruptly curved, stout spine near middle, this spine faintly emarginate apically; anterior femur ventrally with decided angulation near middle; posterior femur ventrally with subapical, oblique, straight spine about two-thirds as long as femoral height.

Terminalia: Gonostylus as illustrated (fig. 299).

Length of body: 2.13(1.82–2.35).

Female: Similar to male but without secondary sexual modifications.

Head: Length-width ratio, 0.42(0.40–0.46):0.53(0.50–0.56); interocular width, 0.30(0.28–0.32). Antennal segments: I, 0.11(0.10–0.13); II, 0.03(0.02–0.04); III, 0.26(0.23–0.30); IV, 0.24(0.23–0.26); V, 0.27(0.24–0.30). Labial segments: I, 0.16(0.15–0.17); II, 0.22 (0.21–0.24; III, 0.26(0.26–0.28); IV, 0.21(0.20–0.23).

Pronotum: Length-width ratio, 0.74(0.63–0.83):1.18(1.03–1.30).

Scutellum: Length-width ratio, 0.50(0.40–0.58):0.55(0.48–0.62).

Length of body: 1.98(1.69–2.15).

Type data.—The type (OxUniv) was reported by Westwood as having come from "Insula Sti. Vincentii."

Specimens studied.—14 males, 21 females, 6 nymphs.

Guatemala: Cacao, Trece Aguas, and Alta Vera Paz, Schwarz and Barber, in cave earth, 2 males, 6 females, 6 nymphs (USNM).

Panama: Barro Colorado Island, Dec. 1946–Feb. 1947, J. Zetek, Z–5272, 1 male (USNM); July 20, N. Banks, 1 female (MCZ). Cabima, May 28, 1911, A. Busck, 1 female (USNM). Río Chilibrillo bat caves, Aug. 29, 1929, Zetek, Molino, and Shannon, 6 males, 2 females (RCF, USNM).

Summit, Nov. 1946, N. L. H. Krauss, 1 female (USNM).

Grenada: Grand Étang Road, H. H. Smith, 5 males, 10 females (USNM).

Discussion.—In the mind of the author there is still some doubt as to the present use of the name *subferrugineus*. However, the assignment is made tentatively on the strength of Dr. Graham's replies to certain questions pertaining to the type.

Many of the Central American specimens came from "bat caves." Caudell (1924, p. 136) reported more fully on the Panama specimens under the name *A. uhleri*, as follows: "Numerous in the guano. All but egg stage obtained. This species was collected by Schwarz and Barber 'in cave earth' at Cacao, Trece Aguas, Guatemala, April 3, 1906." These latter specimens were in the series studied.

Amnestus trimaculatus, new species

PLATE FIGURES 40, 84, 288

DIAGNOSIS.—Among the species with five marginal jugal pegs, this one is most easily identified by the impunctate outer half of the exocorium.

DESCRIPTION.—Color: Head, pronotum and scutellum dark reddish brown; coria and clavus yellowed, former with apical margin of exocorium and subbasal spot and apex of clavus light to dark fuscous; venter, in fully colored specimens, as dark as pronotum; legs and labium yellowed.

MALE: Oval; widest behind middle.

Head: Length more than three-fourths width, 0.43(0.39–0.46): 0.55(0.51–0.58); interocular width, 0.33(0.30–0.37); jugum with five marginal pegs increasing in length apically; surface with broad shallow punctures between eyes. Antennal segments: I, 0.12(0.11–0.16); II, 0.03(0.03–0.04); III, 0.25(0.23–0.30); IV, 0.24(0.22–0.26); V, 0.26 (0.23–0.29). Labium reaching between middle coxae. Labial segments: I, 0.20(0.16–0.23); II, 0.29(0.26–0.31); III, 0.25(0.23–0.27); IV, 0.20(0.20–0.22).

Pronotum: Length almost three-fourths width, 0.96(0.75–1.13): 1.35(1.20–1.52); anterior margin shallowly concave; lateral margin weakly concave on basal half; transverse impression obtusely impressed, marked by row of close-set, elongate, coarse punctures; anterior lobe moderately tumid, with two or three irregular rows of coarse punctures laterally and subapically, minutely punctate along midline and on center of calli; posterior lobe with scattered punctures becoming finer posteriorly, umbones impunctate.

Scutellum: Length three-fourths width, 0.49(0.45–0.56):0.65(0.60–0.73).

Hemelytron: Mesocorium with few punctures apically; exocorium impunctate on outer half.

Propleuron: Prosternal carinae higher than labial II, ventral margin concave (fig. 40).

Legs: Anterior femur with unequally bifid spine ventrally on basal third, with short, subapical tubercle on posteroventral margin; anterior tibia obtusely angled ventrally near middle; posterior femur angled dorsally near apex, ventrally with weakly curved, stout spine (about two-thirds of femoral height) at apical fourth.

Terminalia: Gonostylus as illustrated (fig. 288).

Length of body: 2.26(1.87–2.60).

FEMALE: Similar to male but lacking secondary sexual modifications.

Head: Length-width ratio, 0.42(0.38–0.46):0.55(0.52–0.62); interocular width, 0.31(0.30–0.34). Antennal segments: I, 0.13(0.12–0.15);

II, 0.03(0.03–0.04); III, 0.27(0.23–0.38); IV, 0.22(0.20–0.28); V, 0.26(0.23–0.32). Labial segments: I, 0.18(0.16–0.23); II, 0.28(0.26–0.30); III, 0.25(0.23–0.28); IV, 0.20(0.20–0.21).

Pronotum: Length-width ratio, 0.82(0.73–0.90):1.31(1.17–1.46).

Scutellum: Length-width ratio, 0.49(0.46–0.53):0.65(0.58–0.76).

Length of body: 2.18(1.98–2.42).

Type data.—Holotype male and allotype female (both MCZ), "Soledad, Sta. Clara, Aug. 1932, B. B. Leavitt." Paratypes as follows:

Cuba: Same data as types, 5 males, 8 females (MCZ, RCF). San Vicente, Piñar del Río, July 26–Aug. 5, 1939, C. T. Parsons, 1 female (MCZ). Jarahueca, Oriente Province, July 14–18, 1927, S. C. Bruner, taken in woods, 2 males (KU).

Discussion.—The three black marks on each hemelytron suggested the specific name. At first the author considered this to be the same as Distant's *championi* because of the color pattern but Dr. China's notes on the type reports that that form has the exocorium equally punctate across the full width and so cannot be identified with this one.

Amnestus uhleri Distant

Plate figures 59, 161, 300

Amnestus uhleri Distant, 1880. p. 453.

Diagnosis.—The large size of the body and the greatly elongated clypeus (surpassing apices of juga by more than its own width) strongly mark this species as different from all others in the genus.

Description.—Based on one male and two females. Male: Elongate-oval, widest behind midlength.

Head: Length slightly less than width, 0.86:0.93; interocular width, 0.52; clypeus surpassing truncated apices of juga by more than its own width; surface irregular, impunctate, shining; jugum with five marginal pegs becoming thicker and longer distally. Antennal segments: I, 0.23; II, 0.06; III, 0.45; IV, 0.40; V, 0.37. Bucculae higher than labial II, abruptly terminated posteriorly; labium reaching bases of middle coxae. Labial segments: I, 0.31; II, 0.36; III, 0.40; IV, 0.36.

Pronotum: Length about two-thirds width, 1.71:2.28; anterior margin shallowly and simply emarginate, anterior angles not cupped; lateral margins entire, straight and subparallel on basal three-fourths; transverse impression moderate, punctate; anterior lobe tumid, impunctate except for single lateral subapical row of very closely set, coarse punctures; posterior lobe, except umbones, with numerous small punctures.

Scutellum: Width greater than length, 1.10:0.94.

Hemelytron: Mesocorium with numerous punctures becoming finer and closer apically; exocorium with numerous punctures becoming obsolete toward costa; costa subparallel on basal half.

Propleuron: Prosternal carinae about as high as labial II, evanescent anteriorly, obtusely angled posteriorly.

Legs: Anterior femur ventrally with premedian stout, unequally furcate spine; anterior tibia with ventral margin straight, neither angled nor toothed medially; posterior femur with subapical spine spinose almost rectangularly bent at middle (fig. 161).

Terminalia: Gonostylus as illustrated (fig. 300).

Length of body: 4.17.

FEMALE: Similar to male, except anterior pronotal lobe with minute but distinct punctures discally in addition to subapical and lateral rows of coarser punctures; anterior femur not armed ventrally; posterior femur ventrally with simple, moderate, oblique spine subapically.

Head: Length-width ratio, 0.91(0.90–0.92):0.98(0.95–1.02); interocular width, 0.56(0.52–0.60). Antennal segments: I, 0.22(0.22–0.23); II, 0.07(0.07–0.08); III, 0.44(0.43–0.45); IV, 0.35(0.35–0.36); V, 0.38(0.36–0.40). Labial segments: I, 0.33(0.32–0.35); II, 0.36(0.36–0.36); III, 0.44(0.43–0.45); IV, 0.36(0.34–0.38).

Pronotum: Length-width ratio, 1.75(1.62–1.89):2.41(2.28–2.55).

Scutellum: Width-length ratio, 1.29(1.20–1.39):1.06(0.98–1.14).

Length of body: 4.25(4.04–4.46).

TYPE DATA.—The types (BrM) were listed by Distant as coming from "Guatemala, Zapote (Champion); Panama, Volcán de Chiriqui, 4000 to 6000 feet (Champion)."

SPECIMENS STUDIED.—1 male, 2 females.

MEXICO: *Mexico:* Tejupilco, June 20, 1933, H. E. Hinton, R. L. Usinger, 1 female (RLU). *Veracruz:* Orizaba, Bilimek, 1883, Feb., 1 male, 1 female (Wien).

DISCUSSION.—This "giant" species of *Amnestus* is strongly marked by the greatly prolonged clypeus as well as the type of armature on the posterior femur of both sexes, so it should not be confused with any other known species of the genus.

Unplaced species of *Amnestus*

The following four species were described by Distant (1893). None of these species appeared to be among the material examined and there are not enough data available to permit accurate placement of them in the key or in synonymy. Dr. China informed the author that the types (BrM) are females with five marginal pegs on each jugum. Further study of the types is necessary. To complete the list of species for the region indicated in the title of this paper, the original descriptions are quoted.

Amnestus signoreti Distant

Amnestus signoreti Distant, 1893, p. 452.

ORIGINAL DESCRIPTION:

Black; lateral and frontal margins of head, lateral margins of pronotum and corium, legs, and antennae pale castaneous. Head with the usual frontal and lateral spines; head, pronotum, scutellum, and corium thickly and coarsely punctate; pronotum with a somewhat obscure transverse incision; membrane pale hyaline, ochraceous at base.

Long. 2½ millim.

Hab. GUATEMALA, Quiché Mts. 7000 to 9000 feet (*Champion*).

The thickly and coarsely punctured upper surface and the pale castaneous lateral margins are the salient features of this species, of which we possess only a single example.

REMARKS.—The Zoological Record (vol. 90, p. 477) review of Carvalho's (Bol. Mus. Nac. Rio de Janeiro, No. 118, 1952) treatment of the Miridae in the Biologia Centrali-Americana reported that *Amnestus signoreti* Distant had been transferred to the mirid genus *Mimoncopeltus*. This is in error. In the above paper Carvalho did not indicate Distant's generic placement of the species; and the reviewer, who apparently overlooked the mirid species *Lygdus signoreti* described in a footnote on page 419, used the combination *Amnestus signoreti* instead.

Amnestus dallasi Distant

Amnestus dallasi Distant, 1893, p. 453.

ORIGINAL DESCRIPTION:

Black; antennae, eyes, lateral margins of the pronotum, a broad sublateral fascia to the corium, and the legs pale castaneous; membrane pale ochraceous and subhyaline, the base and apex very pale castaneous. Head coarsely punctate, with the frontal and marginal spines well developed; pronotum with an obscure transverse incision, the anterior lobe with a few scattered discal punctures, and thickly and coarsely punctate at the lateral margins, posterior lobe and scutellum thickly and coarsely punctate; corium more finely punctate, the posterior discal and marginal area impunctate.

Long. 5 millim.

Hab. MEXICO, Chilpancingo in Guerrero (*H. H. Smith*).

A single example.

Amnestus bergrothi Distant

Amnestus bergrothi Distant, 1893, p. 453.

ORIGINAL DESCRIPTION:

Allied to . . . *A. uhleri*, but smaller, the anterior lobe of the pronotum more punctate; apical margin of the corium concolorous, the lateral spines of the head much longer and equal in length to those of the frontal lobe.

Long. 3 millim.

Hab. MEXICO, near the city of Teapa in Tabasco (*H. H. Smith*); GUATEMALA, Pantaleon, Dueñas, San Gerónimo (*Champion*).

Nine examples.

Amnestus stali Distant

Amnestus stali Distant, 1893, p. 454.

ORIGINAL DESCRIPTION:

Head and pronotum castaneous, scutellum black, corium, legs, and antennae ochraceous, apical area of the corium black. Head coarsely punctate, the frontal and lateral spines equally long; pronotum with a distinct transverse impression considerably before the middle, anterior lobe with the anterior and lateral margins thickly and coarsely punctate, and with discal punctures at centre and lateral areas, posterior lobe and scutellum thickly and coarsely punctate; corium more finely punctate, the posterior disc impunctate.

Long. 3 millim.

Hab. GUATEMALA; Quiché Mts. 7000 to 9000 feet (*Champion*).

Allied to the preceding species [*bergrothi*] but structurally distinct by having the pronotum transversely constricted nearer the posterior margin. We have received two examples.

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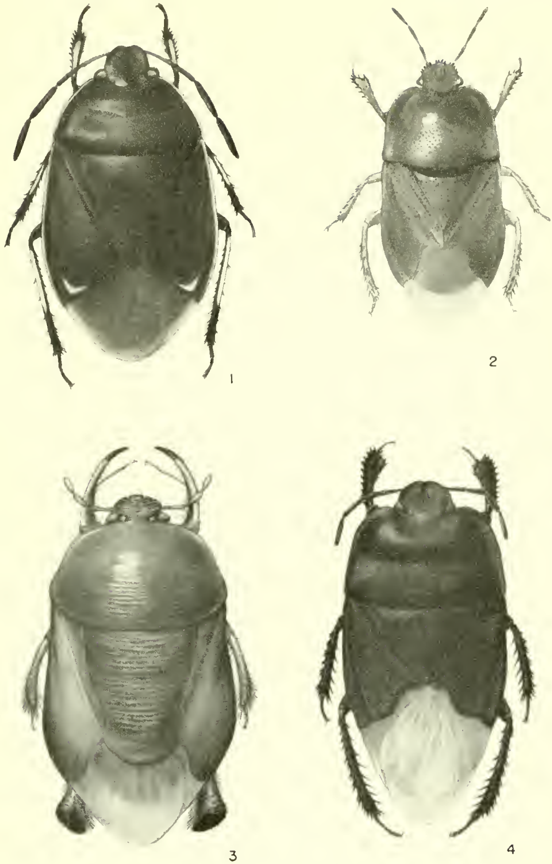
Plates

(With plate figures 1–300)



General habitus, dorsal view: 1, *Sehirus cinctus albonotatus* Dallas; 2, *Amnestus spinifrons* (Say); 3, *Scaptocoris divergens*, new species; 4, *Cydnus aterrimus* (Forster).

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General habitus, dorsal view: 5, *Rhytidoporus indentatus* (Uhler); 6, *Tominotus signoreti* (Mulsant and Rey); 7, *Onalips nigerrimus* (Dallas); 8, *Microporus obliquus* Uhler.

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General habitus, dorsal view: 9, *Macroporus repetitus* Uhler; 10, *Cyrtomenus ciliatus* (Palisot de Beauvois); 11, *Prolobodes giganteus* (Burmeister); 12, *Pangaeus congruus* (Uhler).

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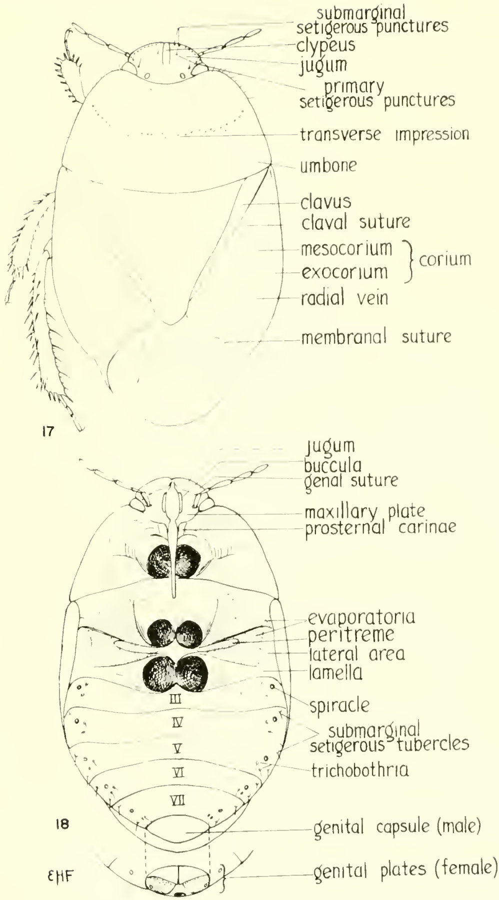
General habitus, dorsal view: 13, *Melanaethus robustus* Uhler; 14, *Pangaeus aethiops* (Fabricius); 15, *Ectinopus holomelas* (Burmeister); 16, *Dallasiellus longulus* (Dallas).



External features used in keys and descriptions: 17, *Prolobodes giganteus*, dorsal view; 18, *Prolobodes giganteus*, ventral view of male, with projection showing external genitalia of female.

Plate 6. Structural Details

Heads—lateral views

19. *Sehirus cinctus*, × 8
20. *Scaptocoris divergens*, × 8
21. *Cydnus aterrimus*, × 8
22. *Ectinopus holomelas*, × 12
23. *Melanaethus robustus*, × 16
24. *Pangaeus aethiops*, × 6
25. *Dallasiellus longulus*, × 9
26. *Dallasiellus reflexus*, × 8
27. *Dallasiellus levipennis*, × 6
28. *Microporus obliquus*, × 13
29. *Microporus obliquus*, × 13
30. *Macroporus repetitus*, × 16
31. *Onalips nigerrimus*, × 13
32. *Rhytidoporus indentatus*, × 16
33. *Pangaeus congruus*, × 13
34. *Cyrtomenus ciliatus*, × 13
35. *Tominotus signoreti*, × 13
36. *Prolobodes giganteus*, × 5
37. *Amnestus spinifrons*, × 16
38. *Amnestus subferrugineus*, × 21
39. *Amnestus foveatus*, × 21
40. *Amnestus trimaculatus*, × 21

Heads—dorsal view

41. *Dallasiellus longulus*, × 8
42. *Dallasiellus lugubris*, × 8
43. *Dallasiellus lugubris*, × 8
44. *Dallasiellus bacchinus*, × 8
45. *Dallasiellus scilus*, × 8
46. *Pangaeus aethiops*, × 6
47. *Pangaeus punctinotum*, × 10
48. *Pangaeus ruginceps*, × 10
49. *Pangaeus setosus*, × 8
50. *Melanaethus robustus*, × 13

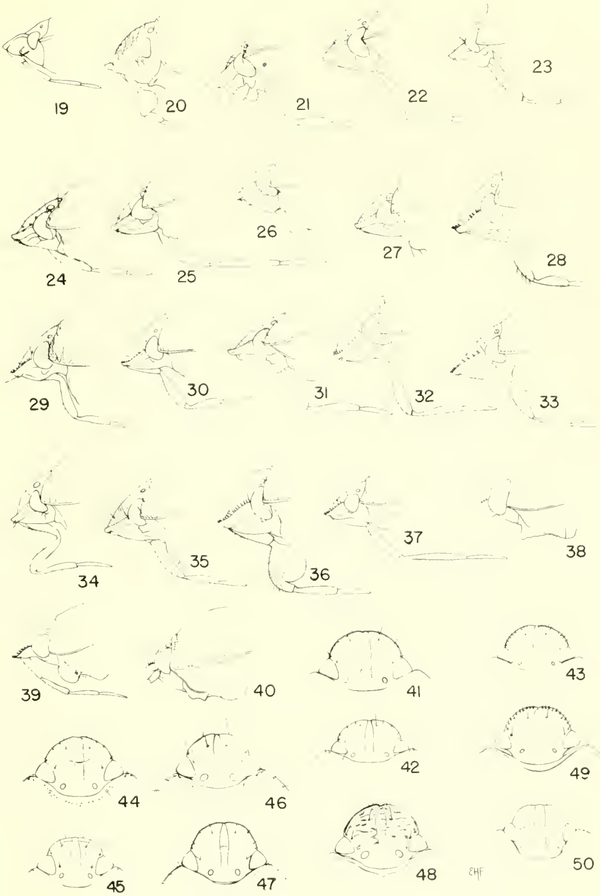

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Plate 7. Structural Details

Heads—dorsal views

51. *Scaptocoris divergens*, × 8
52. *Rhytidoporus indentatus*, × 10
53. *Rhytidoporus barberi*, × 10
54. *Tominotus communis*, × 8
55. *Tominotus communis*, × 8
56. *Cyrtomenus ciliatus*, × 6
57. *Cyrtomenus crassus*, × 6
58. *Cyrtomenus emarginatus*, × 5
59. *Amnestus uhleri*, × 16
60. *Amnestus sexdentatus*, × 21
61. *Amnestus radialis*, × 25

Heads and pronota—dorsal view

62. *Dallasiellus megalocephalus*, × 5
63. *Amnestus pusillus*, × 16
64. *Amnestus explanatus*, × 16
65. *Garsauria aradoides*, × 5

Head, pronotum and scutellum—dorsal view

66. *Ectinopus rugoscutum*, × 5

Pronota—dorsal view

67. *Melanaethus noctivagus*, × 10
68. *Tominotus brevis*, × 6
69. *Tominotus hogenhoferi*, × 5
70. *Tominotus curvipes*, × 3
71. *Tominotus curvipes*, × 3
72. *Tominotus communis*, × 4
73. *Pangaeus rugonotum*, × 6
74. *Pangaeus punctinotum*, × 6
75. *Amnestus lautipennis*, × 16
76. *Amnestus radialis*, × 13
77. *Dallasiellus longirostris*, × 6
78. *Dallasiellus americanus*, × 5

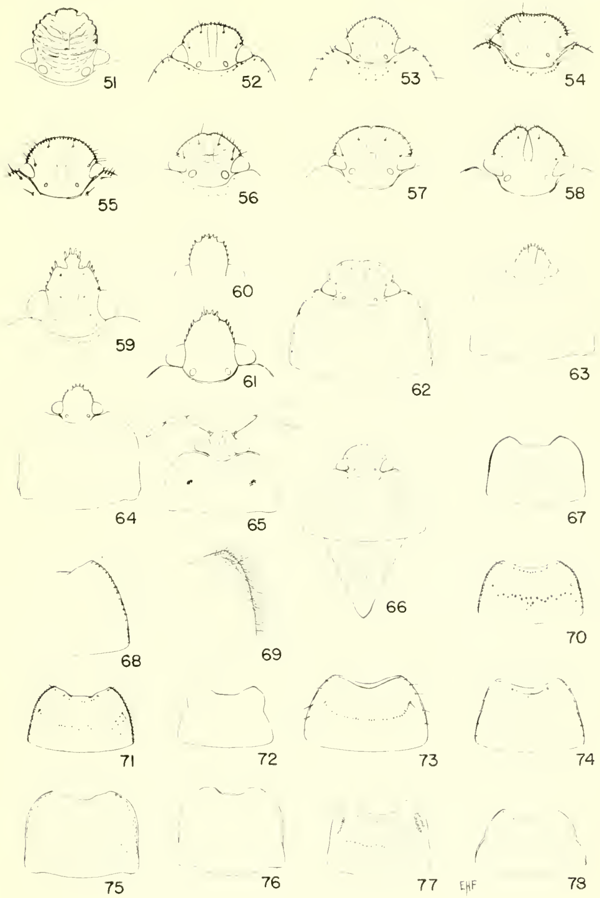
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Plate 8. Structural Details

Scutelli—dorsal views

79. *Tominotus communis*, × 5
80. *Tominotus signoreti*, × 6

Hemelytra—dorsal views

81. *Tominotus blanchardi*, × 6
82. *Tominotus inpuncticollis*, × 5
83. *Pangaeus quinquespinosus*, × 5
84. *Amnestus trimaculatus*, × 10

Mesoleusae metapleurae—ventral view

85. *Scaptocoris castaneus*, × 8
86. *Sehirus cinctus*, × 13
87. *Sehirus morio*, × 8
88. *Garsauria aradoides*, × 10
89. *Cydnus aterrimus*, × 8
90a. *Microporus obliquus*, × 16
90b–d. *Microporus testudinatus*, × 16
91. *Macroporus repetitus*, × 21
92. *Rhytidoporus indentatus*, × 16
93a. *Rhytidoporus compactus*, × 13
93b. *Rhytidoporus diminutus*, × 13
94. *Rhytidoporus lucida*, × 21
95. *Onalips nigerrimus*, × 8
96. *Melanaethus robustus*, × 25
97. *Melanaethus cavicollis*, × 16
98. *Geotomus punctulatus*, × 16
99. *Aethus indicus*, × 13

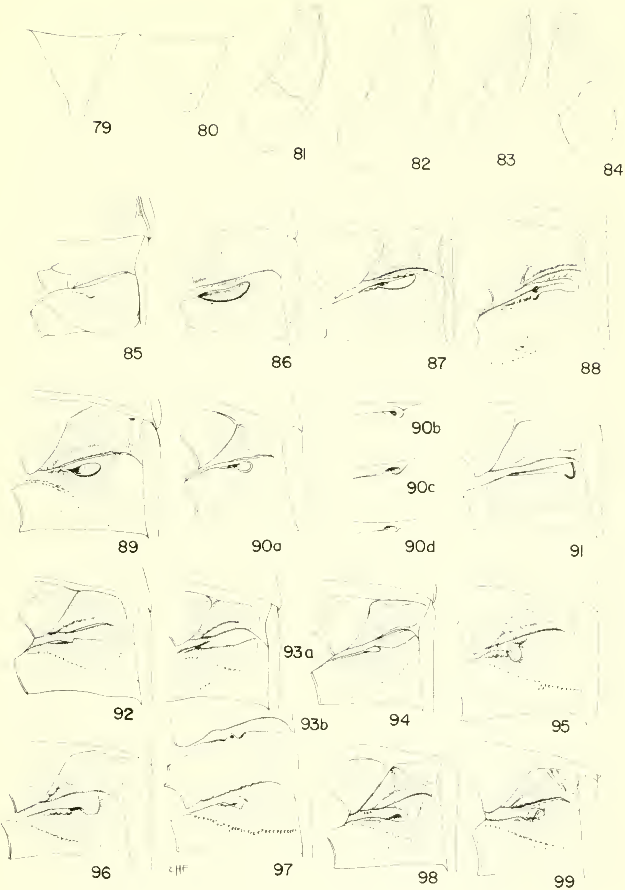
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Plate 9. Structural Details

Mesopleurae and metapleurae—ventral view

100. *Ectinopus holomelas*, ×8
101. *Ectinopus muticus*, ×8
102. *Pangaeus congruus*, ×16
103. *Pangaeus aethiops*, ×8
104. *Pangaeus bilineatus*, ×8
105. *Dallasiellus americanus*, ×13
106. *Dallasiellus discrepans*, ×6
107. *Dallasiellus longulus*, ×10
108. *Dallasiellus interruptus*, ×9
109. *Cyrtomenus ciliatus*, ×10
110. *Prolobodes giganteus*, ×5
111. *Tominotus signoreti*, ×16
112. *Pseudonalips cribratus*, ×8
113. *Amnestus spinifrons*, ×26

Middle coxa—ventral view

114. *Cydnus aterrimus*, ×10

Anterior tibiae—posterior view

115. *Scaptocoris divergens*, ×4

Anterior tibiae—anterior views

116. *Cydnus aterrimus*, ×4
117. *Tominotus signoreti*, ×16
118. *Microporus obliquus*, ×9
119. *Onalips nigerrimus*, ×8

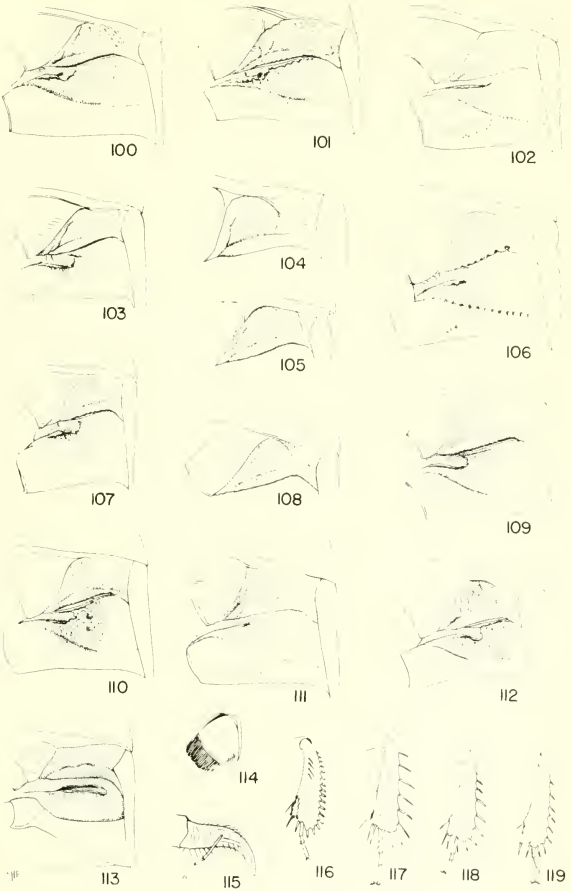
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Plate 10. Structural Details

Anterior tibiae—anterior views

120. *Melanaethus robustus*, × 21
121. *Macroporus repetitus*, × 21
122. *Prolobodes giganteus*, × 5
123. *Cyrtomenus ciliatus*, × 6
124. *Rhytidoporus indentatus*, × 21
125. *Pangaeus congruus*, × 8
126. *Ectinopus holomelas*, × 6
127. *Pangaeus aethiops*, × 9
128. *Dallasiellus dilatipes*, × 8
129. *Dallasiellus longulus*, × 13
130. *Sehirus cinctus*, × 10
131. *Amnestus spinifrons*, × 25
132. *Amnestus basidentatus*, × 25

Middle tibia—posterior view

133. *Scaptocoris divergens*, × 8

Posterior tibiae—apical views

134. *Scaptocoris talpa*, × 5
135. *Scaptocoris castaneus*, × 5

Posterior tibiae—posterior views

136. *Scaptocoris giselleae*, × 5
137. *Scaptocoris divergens*, × 5
138. *Sehirus cinctus*, × 10
139. *Cydnus aterrimus*, × 3
140. *Tominotus signoreti*, × 10
141. *Prolobodes giganteus*, × 4
142. *Cyrtomenus ciliatus*, × 6
143. *Macroporus repetitus*, × 13
144. *Melanaethus robustus*, × 16
145. *Ectinopus holomelas*, × 3
146. *Rhytidoporus indentatus*, × 13
147. *Onalips nigerrimus*, × 6
148. *Dallasiellus discrepans*. × 5
149. *Dallasiellus dilatipes*, × 5
150. *Dallasiellus longulus*, × 8
151. *Microporus obliquus*, × 13
152. *Pangaeus congruus*, × 10
153. *Pangaeus tuberculipes*, × 6
154. *Pangaeus tuberculipes*, × 6
155. *Pangaeus aethiops*, × 5

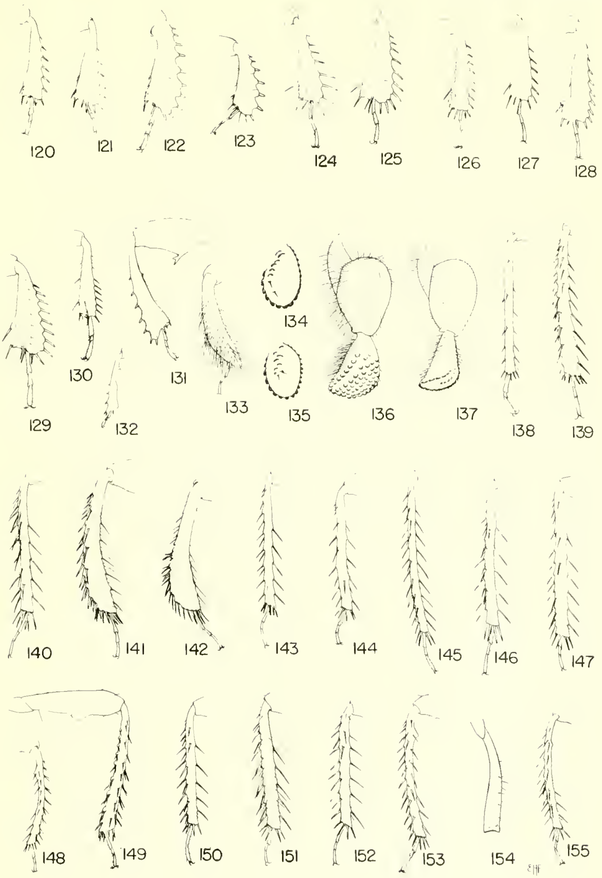
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Plate 11. Structural Details

Posterior legs—posterior views

156. *Pangaeus docilis*, ×13
157. *Pangaeus piceatus*, ×10
158. *Pangaeus quinquespinosus*, ×9
159. *Pangaeus xanthopus*, ×6
160. *Amnestus spinifrons*, ×21
161. *Amnestus uhleri*, ×13
162. *Amnestus pusio*, ×21
163. *Amnestus pusillus*, ×21
164. *Amnestus pusillus*, ×21

Metathoracic wings—anterior parts

165. *Scaptocoris divergens*
166. *Sehirus morio*
167. *Cydnus aterrimus*
168. *Amnestus spinifrons*
169. *Garsauria aradoides*

Sternites—ventral views

170. *Scaptocoris divergens*
171. *Sehirus morio*
172. *Cydnus aterrimus*
173. *Amnestus spinifrons*
174. *Garsauria aradoides*

Male terminalia—posterior views

175. *Dallasiellus megalocephalus*, ×12
176. *Dallasiellus laevis*, ×16
177. *Pangaeus aethiops*, ×9
178. *Scaptocoris divergens*, ×16
179. *Amnestus spinifrons*, ×16
180. *Onalips bisinuatus*, ×2
181. *Onalips completus*, ×2

Female terminalia—posterior views

182. *Ectinopus holomelas*, ×5
183. *Ectinopus rugoscutum*, ×6
184. *Amnestus pusillus*, ×21
185. *Amnestus spinifrons*, ×16
186. *Cydnus aterrimus*, ×16
187. *Scaptocoris divergens*, ×8

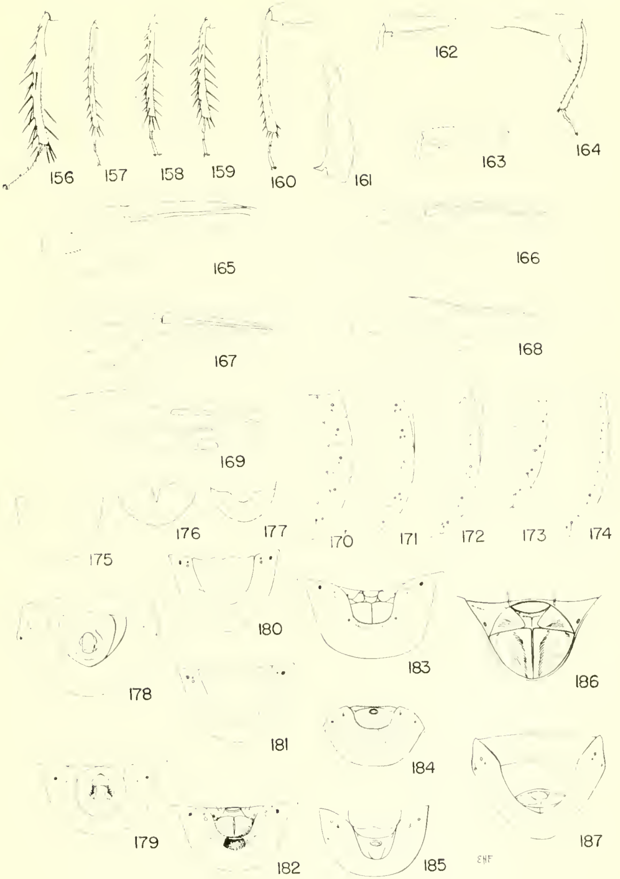
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Plate 12. Structural Details

Dextral gonostyli of males—mesal views, ×26

188. *Sehirus cinctus*
189. *Scaptocoris divergens*
190. *Scaptocoris minor*
191. *Scaptocoris talpa*
192. *Scaptocoris castaneus*
193. *Rhytidoporus indentatus*
194. *Rhytidoporus barberi*
195. *Rhytidoporus compactus*
196. *Macroporus repetitus*
197. *Microporus testudinatus*
198. *Microporus obliquus*
199. Number omitted
200. *Cydnus aterrimus*
201. *Ectinopus holomelas*
202. *Ectinopus rugoscutum*
203. *Onalips bisinuatus*
204. *Onalips completus*
205. *Onalips nigerrimus*
206. *Melanaethus aereus*
207. *Melanaethus anthracinus*
208. *Melanaethus cavicollis*
209. *Melanaethus crenatus*
210. *Melanaethus noctivagus*
211. *Melanaethus mixtus*
212. *Melanaethus pensylvanicus*
213. *Melanaethus subglaber*
214. *Melanaethus planifrons*
215. *Melanaethus robustus*
216. *Melanaethus spinolae*
217. *Melanaethus subpunctatus*
218. *Melanaethus uhleri*
219. *Pangaeus congruus*
220. *Pangaeus bilineatus*
221. *Pangaeus rugiceps*
222. *Pangaeus setosus*
223. *Pangaeus tuberculipes*
224. *Pangaeus pluripunctatus*
225. *Pangaeus bisetosus*
226. *Pangaeus docilis*
227. *Pangaeus impressus*
228. *Pangaeus laevigatus*
229. *Pangaeus moestus*
230. *Pangaeus neogeus*
231. *Pangaeus piceatus*
232. *Pangaeus punctinotum*
233. *Pangaeus rubrifemur*
234. *Pangaeus quinquespinosus*
235. *Pangaeus aethiops*

236a. *Pangaeus semibrunneus*

236b. *Pangaeus xanthopus*

237. *Prolobodes giganteus*
238. *Prolobodes gigas*
239. *Prolobodes reductum*
240. *Cyrtomenus emarginatus*
241. *Cyrtomenus teter*

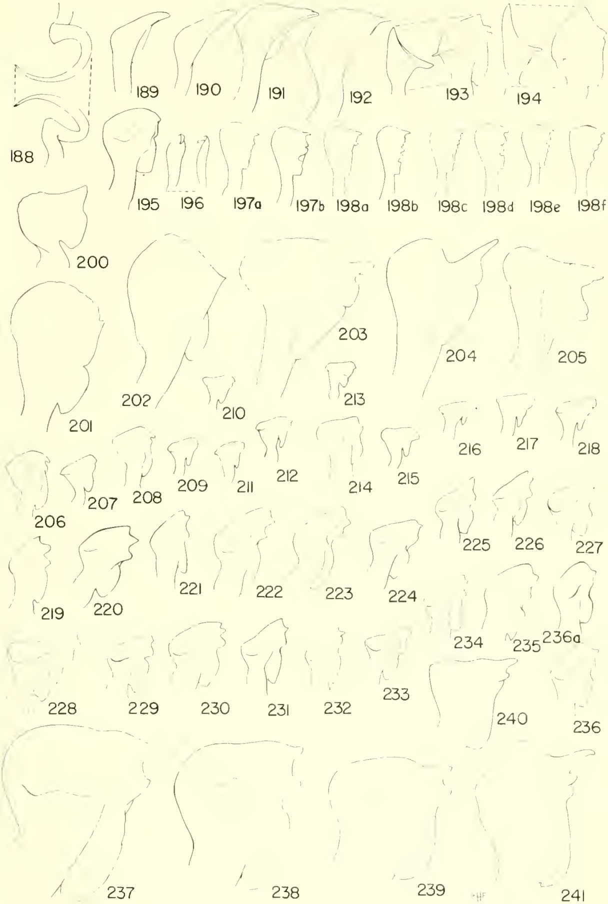
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PLATE 13. STRUCTURAL DETAILS

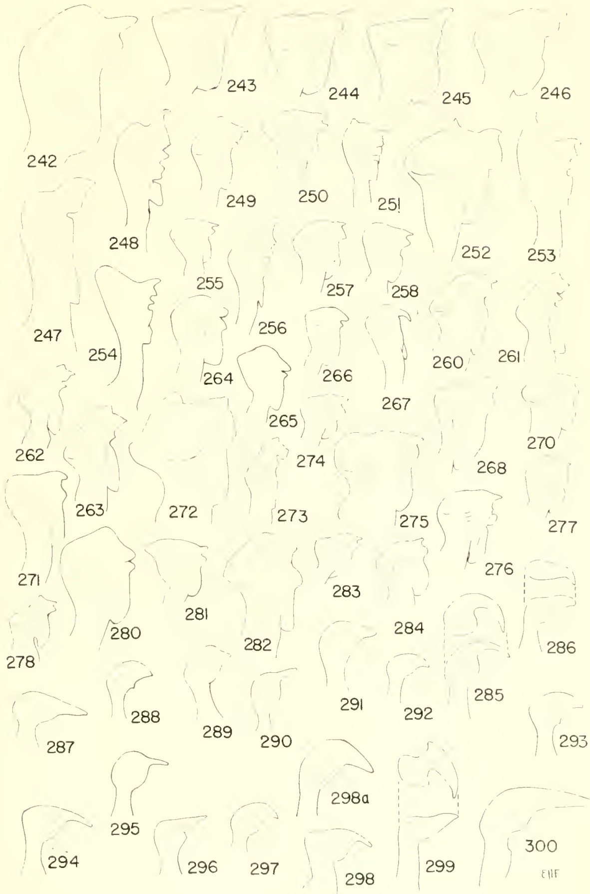
Dextral gonostylus of males—mesal view

Figs. 242–284, ×26; Figs. 285–300, ×110

242. *Cyrtomenus grossus*
243. *Cyrtomenus bergi*
244. *Cyrtomenus ciliatus*
245. *Cyrtomenus crassus*
246. *Cyrtomenus mirabilis*
247. *Tominotus brevirostris*
248. *Tominotus brevis*
249. *Tominotus caecus*
250. *Tominotus communis*
251. *Tominotus conformis*
252. *Tominotus curvipes*
253. *Tominotus hogenhoferi*
254. *Tominotus impuncticollis*
255. *Tominotus laeviculus*
256. *Tominotus signoreti*
257. *Tominotus unisetosus*
258. *Tominotus inconspicuus*
259. Number omitted
260. *Dallasiellus californicus*
261. *Dallasiellus discrepans*
262. *Dallasiellus puncticoria*
263. *Dallasiellus vanduzeei*
264. *Dallasiellus americanus*
265. *Dallasiellus scitus*
266. *Dallasiellus laevis*
267. *Dallasiellus longirostris*
268. *Dallasiellus megalocephalus*
269. Number omitted
270. *Dallasiellus alutaceus*
271. *Dallasiellus bergi*
272. *Dallasiellus dilatipes*
273. *Dallasiellus fusus*
274. *Dallasiellus lugubris*
275. *Dallasiellus interruptus*
276. *Dallasiellus longulus*
277. *Dallasiellus murinus*
278. *Dallasiellus orchidiphilus*
279. Number omitted
280. *Dallasiellus planicollis*
281. *Dallasiellus puncticeps*
282. *Dallasiellus solitaria*
283. *Dallasiellus viduus*
284. *Dallasiellus bacchinus*
285. *Amnestus basidentatus*
286. *Amnestus championi*

286a. *Amnestus lateralis*

287. *Amnestus brunneus*
288. *Amnestus trimaculatus*
289. *Amnestus cribratus*
290. *Amnestus explanatus*
291. *Amnestus forreri*
292. *Amnestus lautipennis*
293. *Amnestus foveatus*
294. *Amnestus pallidus*
295. *Amnestus pusillus*
296. *Amnestus pusio*
297. *Amnestus radialis*
298. *Amnestus spinifrons*
299. *Amnestus subferrugineus*
300. *Amnestus uhleri*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Richard C. Froeschner

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